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AMERICAN BREEDERS MAGAZINE

A JOURNAL OF GENETICS

Horses and Horse Breeding
H. K. BUSH-BROWN

Organization and Work of the Eugenics Record Office
H. H. LAUGHLIN

Age Factor in Register-of-Merit Jerseys
E. N. WENTWORTH

An Experiment in Fur-Seal Conservation
BARTON W. EVERMANN

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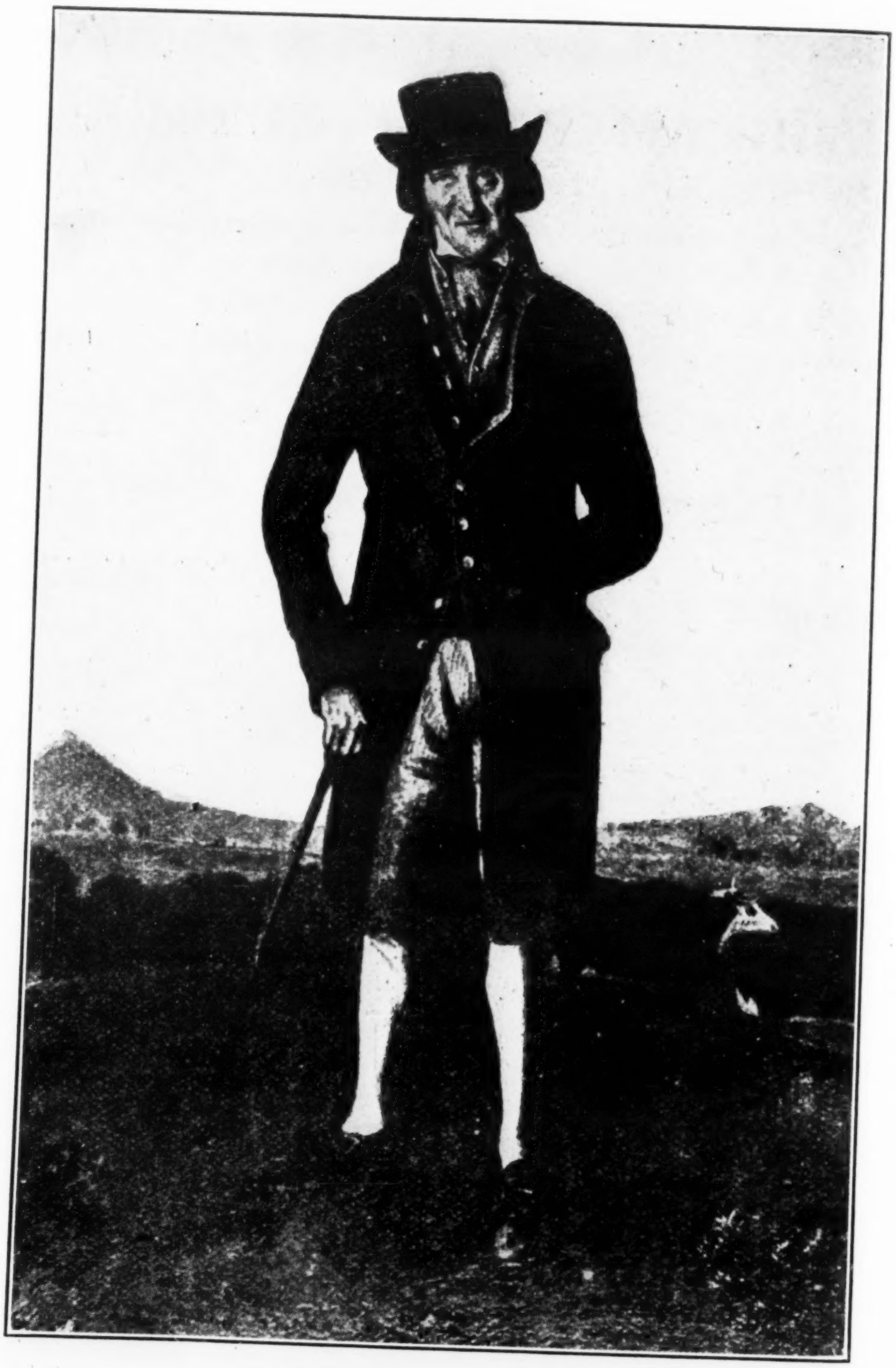

Benjamin Tomkins, Jr.

THE AMERICAN BREEDERS MAGAZINE

"There is no wealth but life, and if the inherent quality of life fails, neither battleships, nor libraries, nor symphonies, nor free trade, nor tariff reform, nor anything else will save a nation."—SALEEBY.

Vol. II Second Quarter, 1911 No. 2

BENJAMIN TOMKINS, JR., 1745-1815.

The difference in quality between the primitive wild cattle of Europe and the common native cattle as owned by the better farmers two hundred years ago was probably not so great as the difference between the latter cattle and the purebred registered breeds of cattle of today.

Two masters who took as their raw material the native cattle of the district in which they lived and created out of that blood a new and distinct breed were Benjamin Tomkins, and his son, Benjamin Tomkins, Jr. The Hereford breed of cattle was their creation. Early agricultural writers and historians frequently confounded these two men, referring to them as one person. But Mr. W. H. Bustin of Hereford, England, discovered records which went to show that the father, Benjamin Tomkins, Sr., began the systematic breeding and improvement of the cattle of Herefordshire in 1742, before the birth of his more widely known son.

The grandfather, Richard Tomkins, had owned and bred Hereford cattle all his life. But the idea of systematic improvement of the cattle strains for a specific purpose was original with his son Benjamin Tomkins and was continued by his grandson, Benjamin Tomkins, Jr. Hence these two men may be said to be the first to have conceived the idea of breeding these cattle especially for beef purposes. The beginning of their operations as originators of modern plans of breed improvement antedates Bakewell's with sheep and cattle.

The periods of activity of the Tomkinses, senior and junior, overlap. The father began his breeding operations in 1742 and continued till 1789. The son began active work in 1769 and carried it on until his death in 1815. During this total of seventy-three years they wrought together for a period of perhaps thirty years. It is also interesting to note that for nearly thirty years after the death of Benjamin Tomkins, Jr., his breeding work was continued

by his daughters, and they are credited with having used good judgment and having been successful.

Benjamin Tomkins, Jr., was a quiet, steady, and patient worker; with consummate skill he built up his breed, refusing nothing good from outside herds, but clinging steadfastly to the plan of using bulls only of his own breeding, and this practice was continued by the daughters during the time they were in possession of the herd.

Tradition has it that three cows formed the original foundation of the Tomkins breeding operations—Pigeon, Mottle, and Silver. From Silver came the Silver Bell who is considered to have been the individual most potent in the early improvement of the breed. It is quite possible that Tomkins discovered that he had a strain of blood which when narrowly bred would produce splendid animals and that this closely bred stock was uniformly better than that produced by outcrossing. This may have been another case of mutation and of a breeder who fell into the plan, or philosophically adopted the plan, of inbreeding until he had made a distinct breed, combining excellence of individuality and potency both for pure breeding and upgrading.

At the time when Tomkins, Jr., was busily engaged in his work, he had no idea that soon a period would come when agricultural conditions on the North American continent would undergo an almost magical transformation, and that on hundreds of thousands of farms a live stock industry would develop in which his favorite cattle would play an important part. The transportation of this breed from its English home, and its perfect and instantaneous adaptation to the entirely new and different conditions and to a variety of climates on the American continent, is certainly the most noteworthy incident in the history of the cattle of Herefordshire.

The magnitude of the breeding operations carried on within this breed at present and the amount of wealth directly produced by them annually would be difficult to compute. This fact, however, boldly stands out: The breed developed on the 300-acre farm of the Tomkinses has spread over and enriched the agriculture of at least three continents. The stream of potent blood from the small nucleus herd has widened until it is now carried in the veins of hundreds of thousands of cattle beasts, vitalizing the agriculture and commerce of many countries.

HORSES AND HORSE BREEDING

H. K. Bush-Brown
Washington, D. C.

Horse breeding has been followed as a trade ever since animals were first domesticated, but for only about a century have stud-book records been kept of the breeding of the different families of horses. The study of types has only quite recently been taken up by men of science with a view of ascertaining the origin of the species and to differentiate their characteristics.

As a result of this study, based upon those anatomical differences and variations which have resulted from wide geographical distribution, and which probably originated in early geological times, it may be accepted that there are four families or species of horses.

The first type in this classification is the Celtic horse, found on the west coast of Norway, known as the Fjord horse in Iceland, Faeroe, Barra, and other small islands of the outer Hebrides, in northern Scotland, on the Shetland Isles, and in Connemara or northern Ireland. There has also been found a close kinship between the Celtic horse and the true Tarpan horse of Russia. The principal characteristics of this type are that, in common with the asses and zebras, it has no callosities on its hind legs, and has a black stripe the entire length of the back and through the tail. It is also frequently striped on the legs and shoulders like the asses, and is of a brown or light dun color.[1]

Nature establishes harmonious groups of plants, trees, and animals, and, certain conditions of climate being given, certain groups of animals and plants are found associated. The small red deer of Norway was an original associate of the Celtic horse, and as this deer is related to the red deer of some parts of France and of Spain, also of Sardinia and the Barbary States, the question naturally arises whether the small ponies of those same regions, though now known only as domestic animals, may not be proven to be kindred to the Celtic horse. If the characteristics mentioned above are present in any measure it would seem to prove the point. Scientific research in this direction has not been pursued, and an inviting field is open to any one who cares to follow this subject further.

The second type of horse is the Prejevalsky, found in a wild state on the steppes of central Asia. There are a few of these in England on the estate of the Duke of Bedford, and several specimens are

[1] The origin of the So-Called Atlantic Animals and Plants of Western Norway, by Leonhard Stejneger. Report Smithsonian Institution, Washington, D. C., page 470.

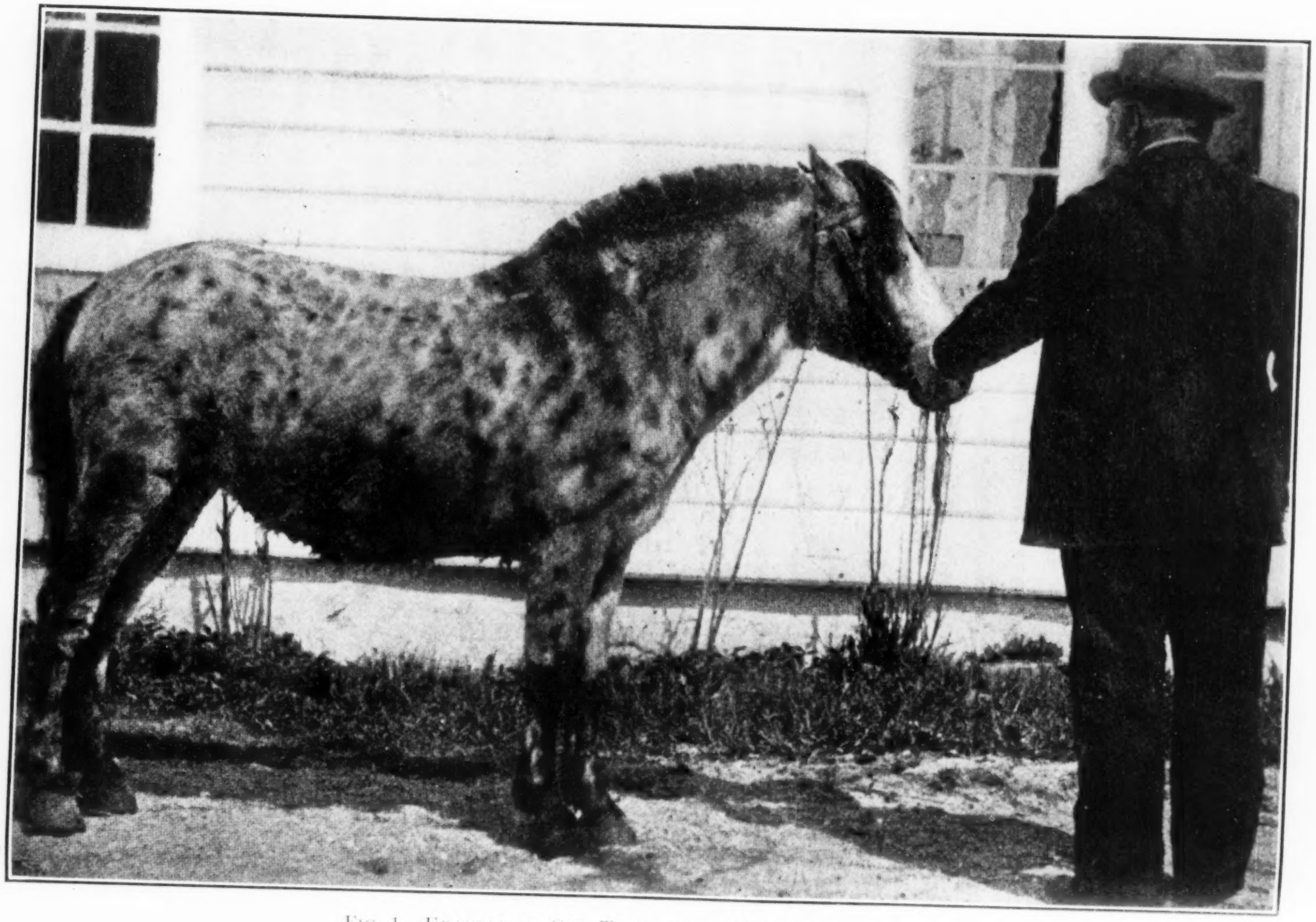

FIG. 1.—EXAMPLE OF ONE TYPE OF THE CELTIC PONY FAMILY.
Showing bars or stripes of dark color like the zebra.

being bred in the New York Zoological Gardens. The Prejevalsky horse is of a red brown color with a light "mealy" nose, has a large head in proportion to his body and is "cat hammed," and less powerful than the Celtic horse. Some writers have assumed that the Tarpan and the Prejevalsky horses belonged to the same family, but this is not now accepted, on account of their marked differences, the most conspicuous of which is that the Prejevalsky has the callosities on his hind legs. In this family it usually takes the form of a narrow strip and not drop-shaped as is common with other horses.

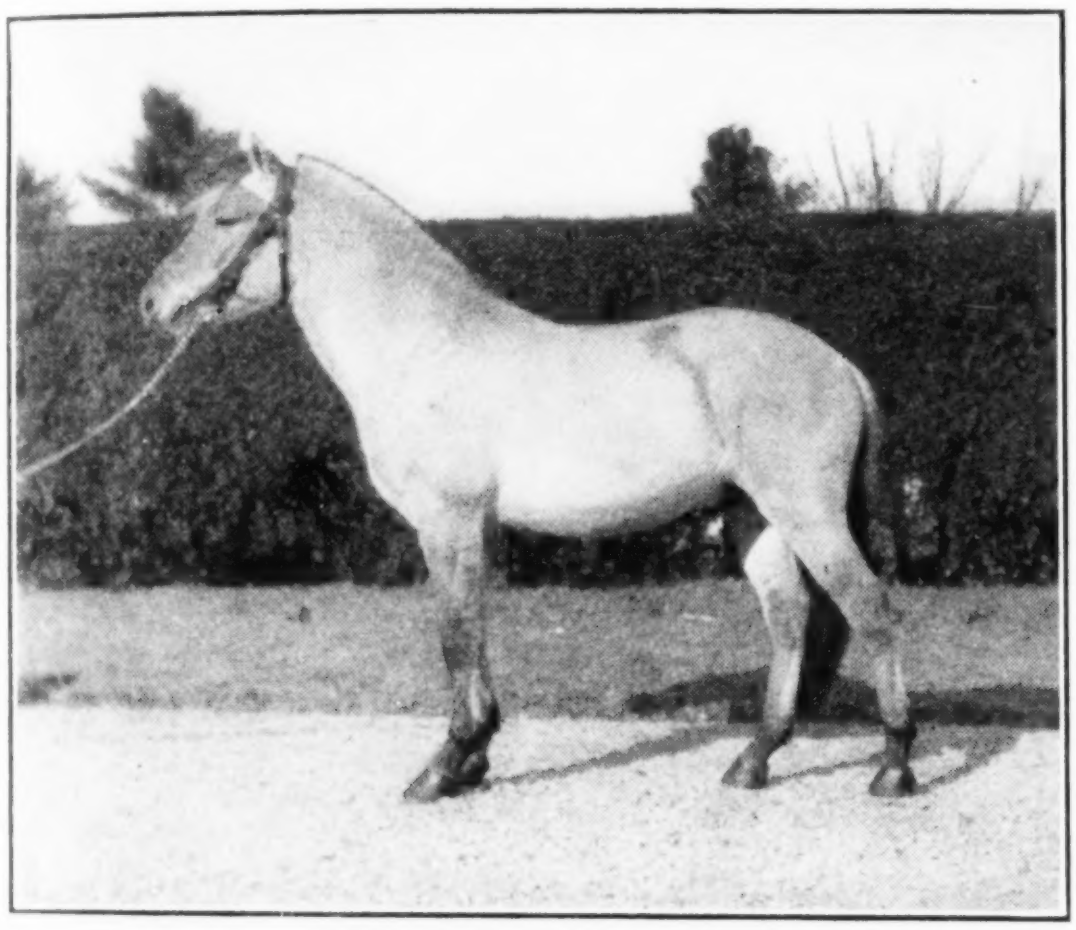

FIG. 2.—FOUR-YEAR-OLD NORWAY FJORD HORSE.
Bred at the Nordfjord Stud, Barrytown, N. Y.; 14 hands; 850 lbs.; shows zebra-like bars on his legs and black stripe in mane.

FIG. 1.—EXAMPLE OF ONE TYPE OF THE CELTIC PONY FAMILY.
Showing bars or strips of dark color like the zebra.

Prof. Henry Fairfield Osborn of the New York Museum of Natural History has given an interesting account of this horse in a pamphlet and compared him with the drawings on bone of the cave dwellers, the first known picture of the horse, and their characteristics seem identical.

There has been a suggestion that this little horse, only twelve hands high, is the living example of the original ancestor of the draft horses of Europe, but it seems highly improbable, inasmuch as fossils of the draft type have been found showing its great antiquity, and I am more inclined to believe that these big types are a species by themselves. Therefore, I shall so class them until there is more evidence to the contrary, and call this family the third type. This horse is known to science as the Forest horse because he originally obtained his food by browsing on shrubs and low trees. This location of his food set his head at right angles to his neck, which is in strong contrast with the Celtic and also the Arab horse. The head of the Forest horse is long and narrow and the face is particularly long from the eyes to the nose. The

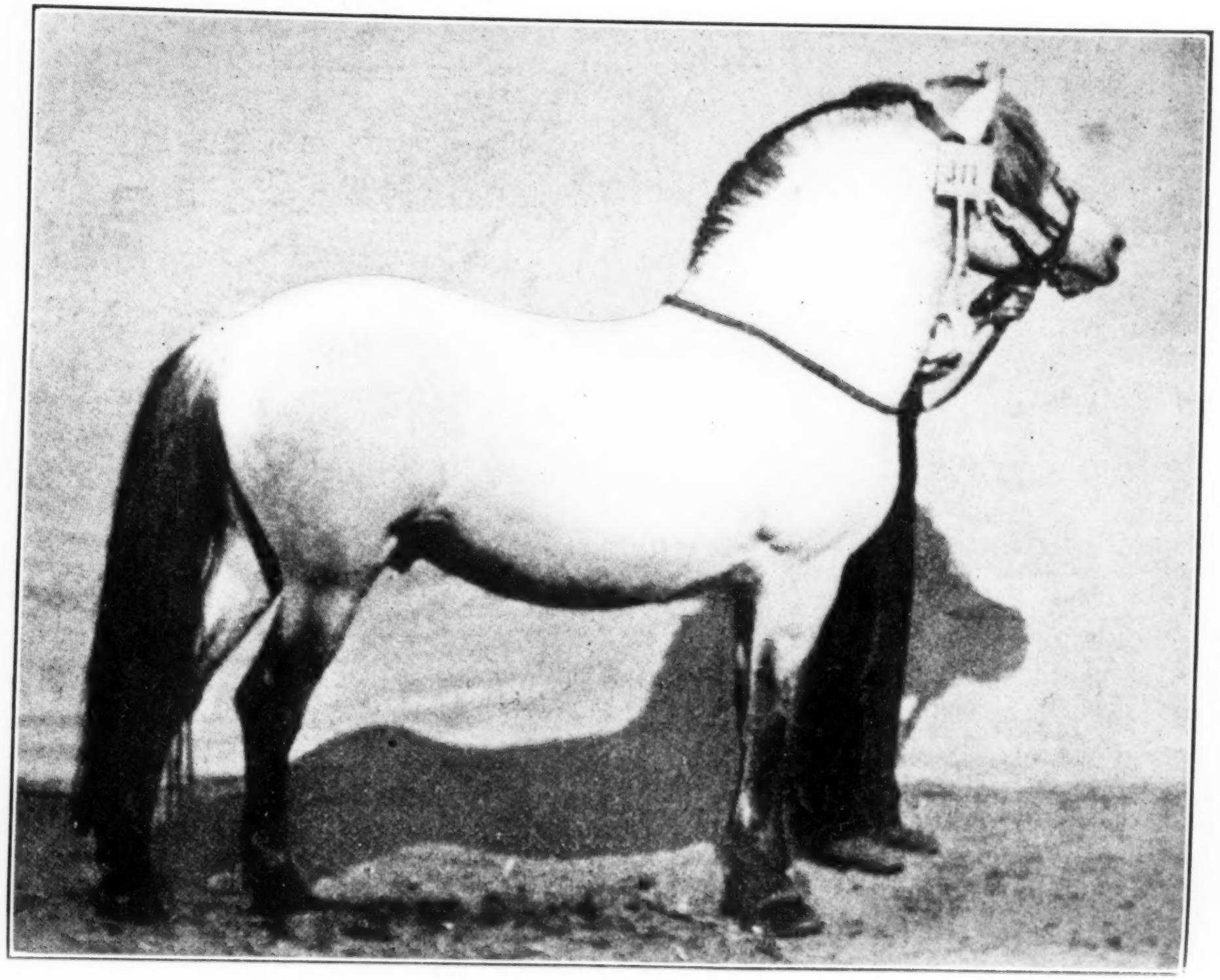

FIG. 3.—CELTIC PONY DEVELOPED IN NORWAY FOR SHOW PURPOSES
He shows the characteristic black mark down his mane.

eyes are set well in the skull instead of projecting like those of the Arab horse. These characteristics of the head are dominant, that is, transmitted to the hybrid descendants. This phase of the subject I shall dwell on later.

The Arab or African horse forms the fourth type in our classification. His food is the grasses that grow on the ground and his home

FIG. 3.—CELTIC PONY DEVELOPED IN NORWAY FOR SHOW PURPOSES.
He shows the characteristic black mark down his mane.

FIG. 4.—PREJEVALSKY HORSE IN NEW YORK ZOOLOGICAL GARDENS.

has always been the open plains and hillsides remote from forest. Therefore his head is articulated on his cervical vertebra at an obtuse angle, thus forming "Hogarth's line of beauty." This set of the head has long been recognized by breeders as a constituent element of beauty, but I think it has not before been explained in this way.

In the forearm of the Arab horse we find the ulna differently developed from that of the European or Forest horse, but this is of minor consequence to breeders. The principal anatomical difference

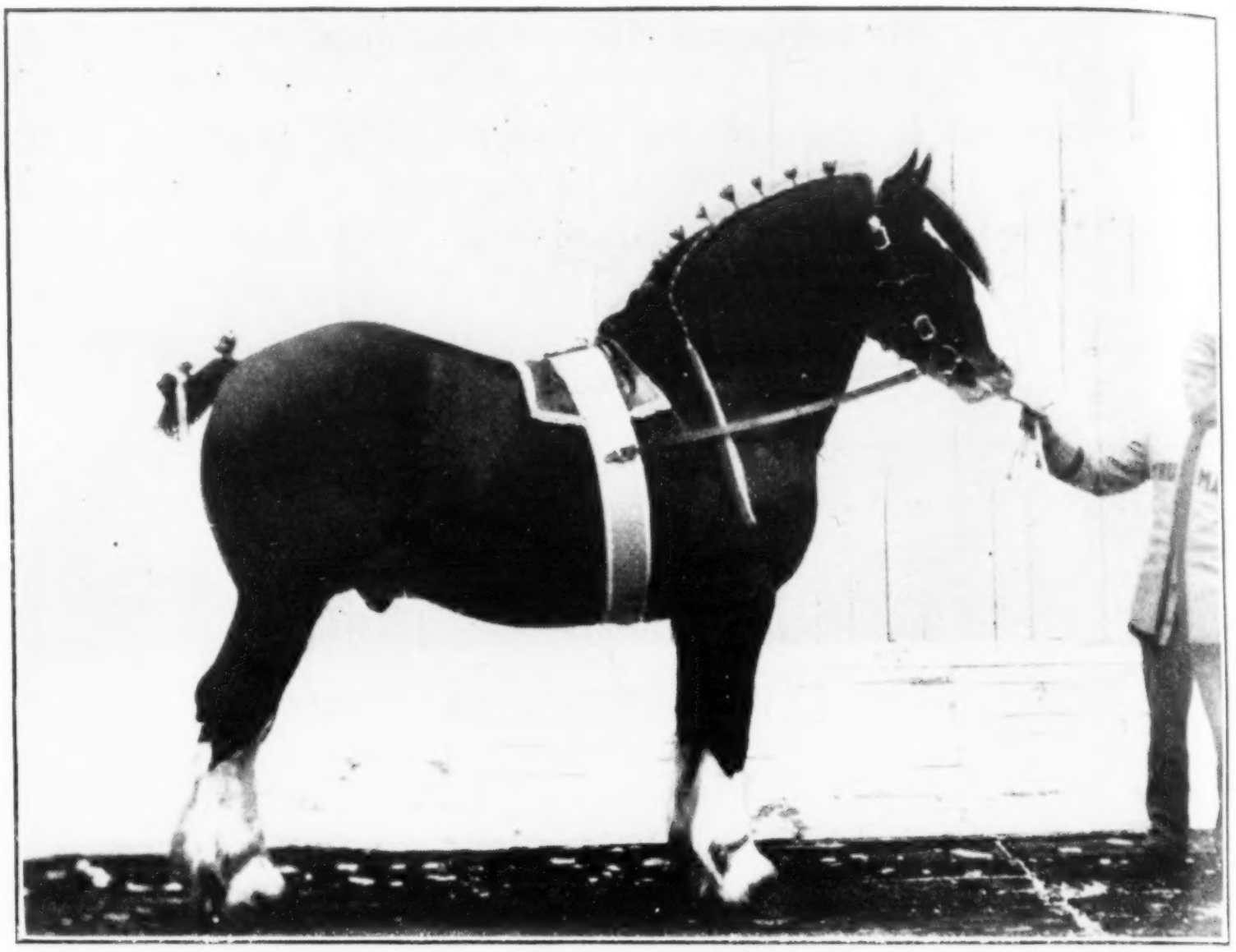

FIG. 5.—MAZEMOAR HAROLD.
Champion Shire stallion, age 17 years.

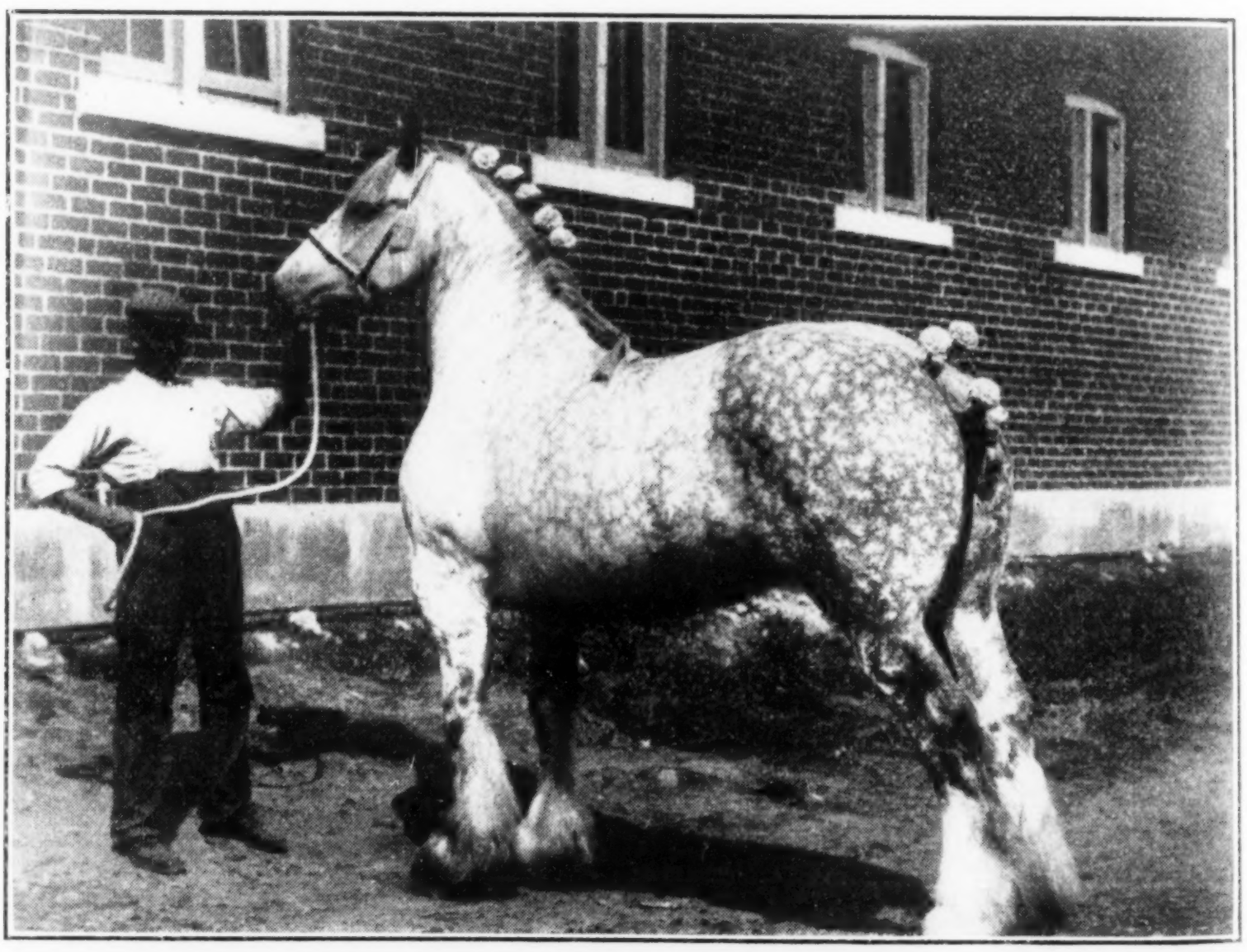

FIG. 6.—WYDELAND'S STARLIGHT.
Champion Shire mare, aged 8 years.

between these two families of horses is in the fact that the European draft horse, like all other families of the horse, has six lumbar vertebræ whereas the Arab horse has but five. This difference in their structure seems to me one of great importance to horse breeders. It probably explains why the Arab horse, which is small in size, is capable nevertheless of carrying great weight and possesses such marvelous endurance. The back is strong because it is short between supports, which is an axiom of engineering in bridging. To what extent

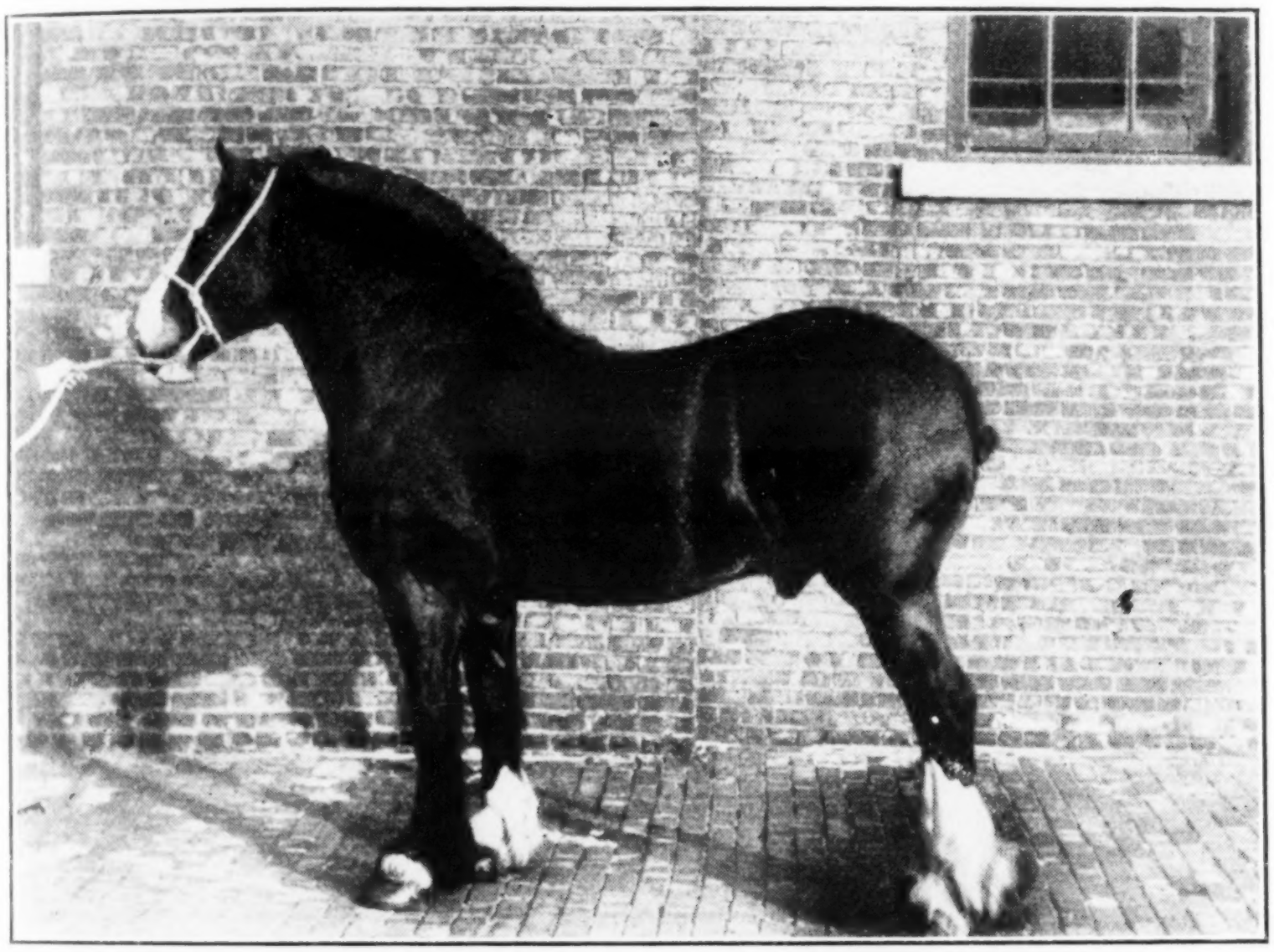

FIG. 7.—BARON'S VAUCHER.
Champion Clydesdale stallion, aged 6 years.

this endurance and the short back are transmitted to the hybrid offspring of the Arab and the Forest horse has never been determined by sufficient scientific research. So far as I have been able to ascertain, all horses other than the Arab have six lumbar vertebræ.

The Thoroughbred horse with 75 per cent or more of Arab blood seems to have developed certain peculiarities in the lumbar vertebræ, judging from the two specimens it has been my privilege to study. In that of Lexington in the National Museum at Washington there seems to have been an effort on the part of nature to eliminate the sixth vertebra to the extent that it is much reduced in size and the spine inclines towards the tail like the sacral vertebræ instead of toward the shoulders like the lumbar vertebræ. All sacral vertebræ

are coalesced together, but this sixth lumbar is not at all coalesced with the sacral. Were it so, there would have been six instead of five sacral vertebræ, which is normal. Thus nature, in an effort to eliminate, reduced the size and gave it intermediate characteristics, partly sacral and partly lumbar.

These same peculiarities of the sixth vertebra may be seen in the skeleton of the rearing horse in the Museum of Natural History in

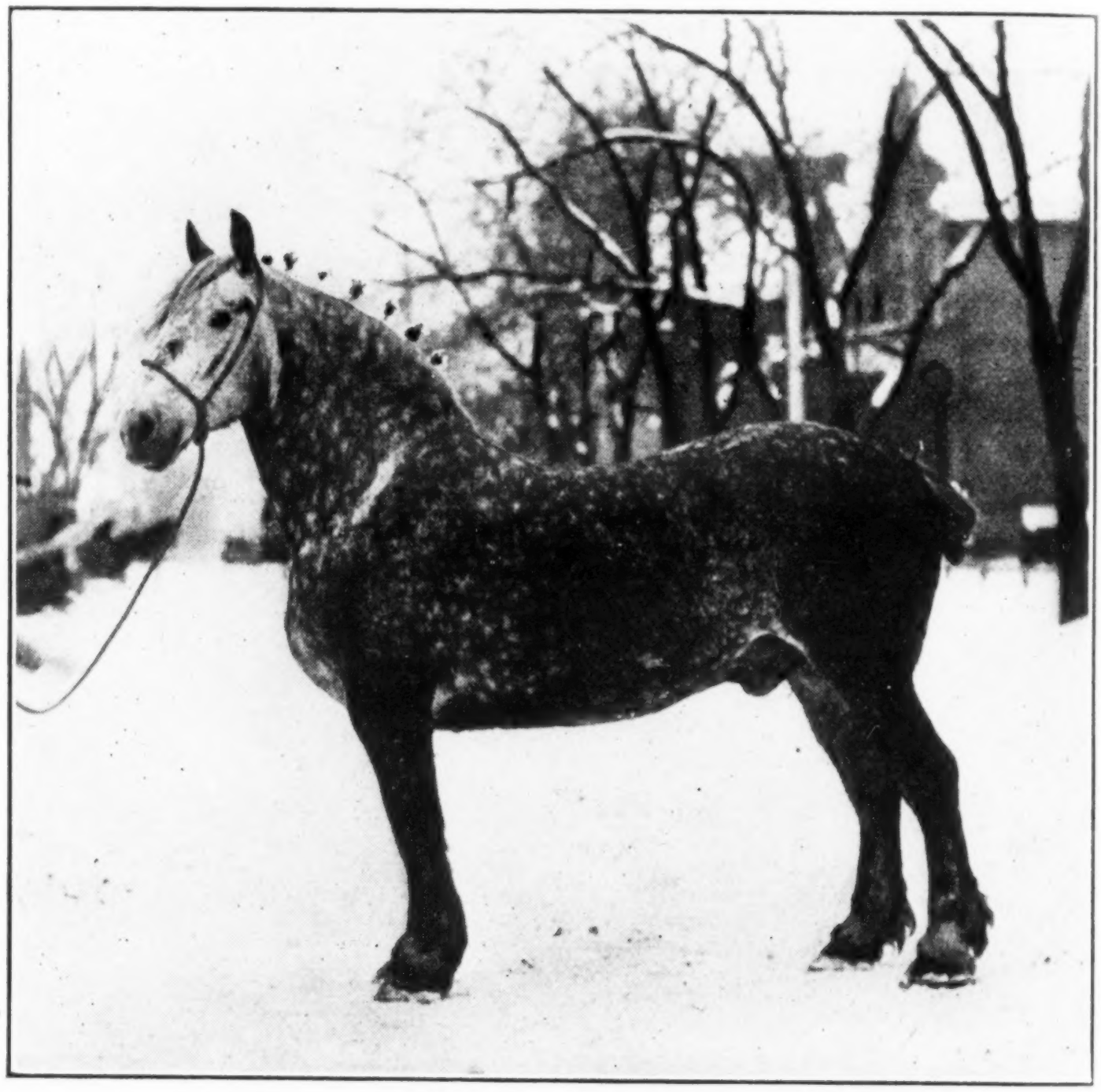

FIG. 8.—GEORGE.
Percheron.

New York, but unfortunately his pedigree has not been preserved, so we can only assume that he was a Thoroughbred of high type.

In the case of Sysonby, another Thoroughbred, whose skeleton is in the Museum of Natural History in New York, the sixth lumbar vertebra is fully developed in size, but is thoroughly coalesced with the fifth, making a double bone and thus greatly strengthening the back at its weakest point. This is not uncommon in other horses. It does not occur, however, in the two trotters I have examined. Are these two animals merely individual freaks of nature or do they

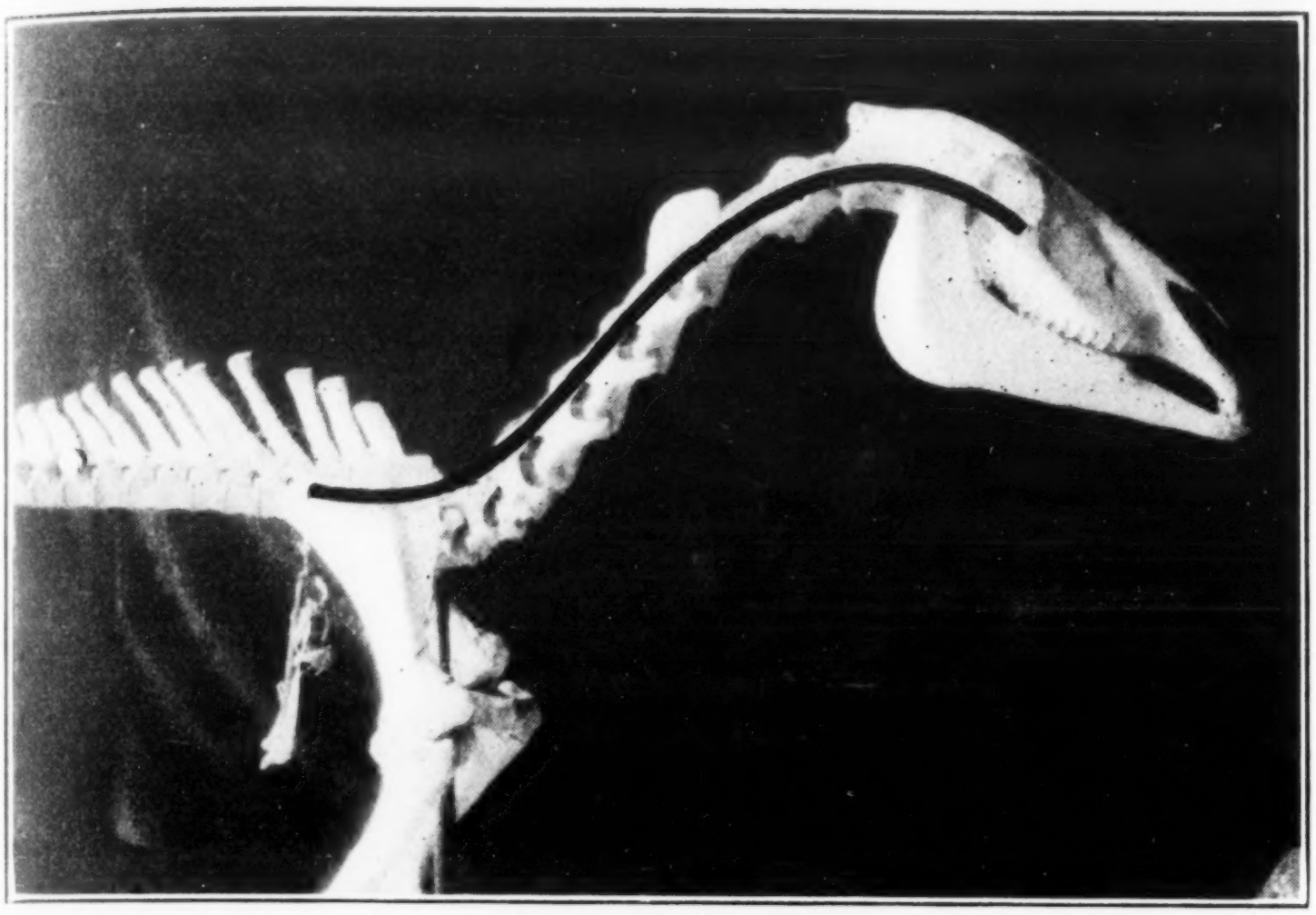

FIG. 9.—SKELETON OF ARAB HORSE.
Articulation of head on cervical Vertebra and Hogarth's line of beauty superimposed.

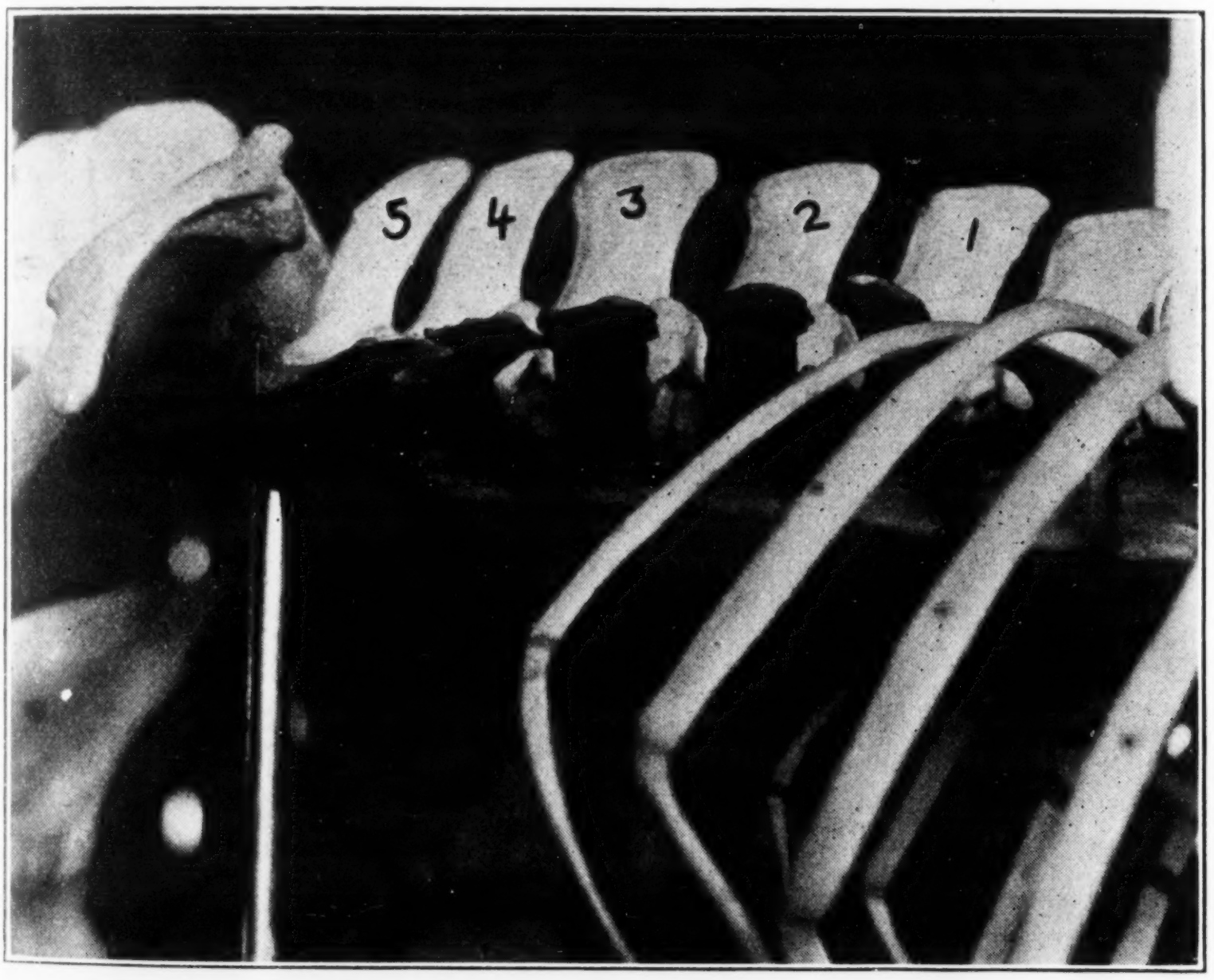

FIG. 10.—SKELETON OF ARAB HORSE NIME.
Showing five lumbar vertebrae, Museum of Natural History, New York.

appear in all or most Thoroughbreds? And had the structure of Lexington's back anything to do with making him the greatest 60-mile horse of the world? Or Sysonby's with his noted performances?

The Thoroughbred horse is a product of breeding the Forest mare to the Arab horse until only a small portion of the Forest type remains, and if therefore the sixth lumbar vertebra always asserts itself, it leads to the statement that under such conditions of breeding, the sixth vertebra is a dominant quality. I have asked what the

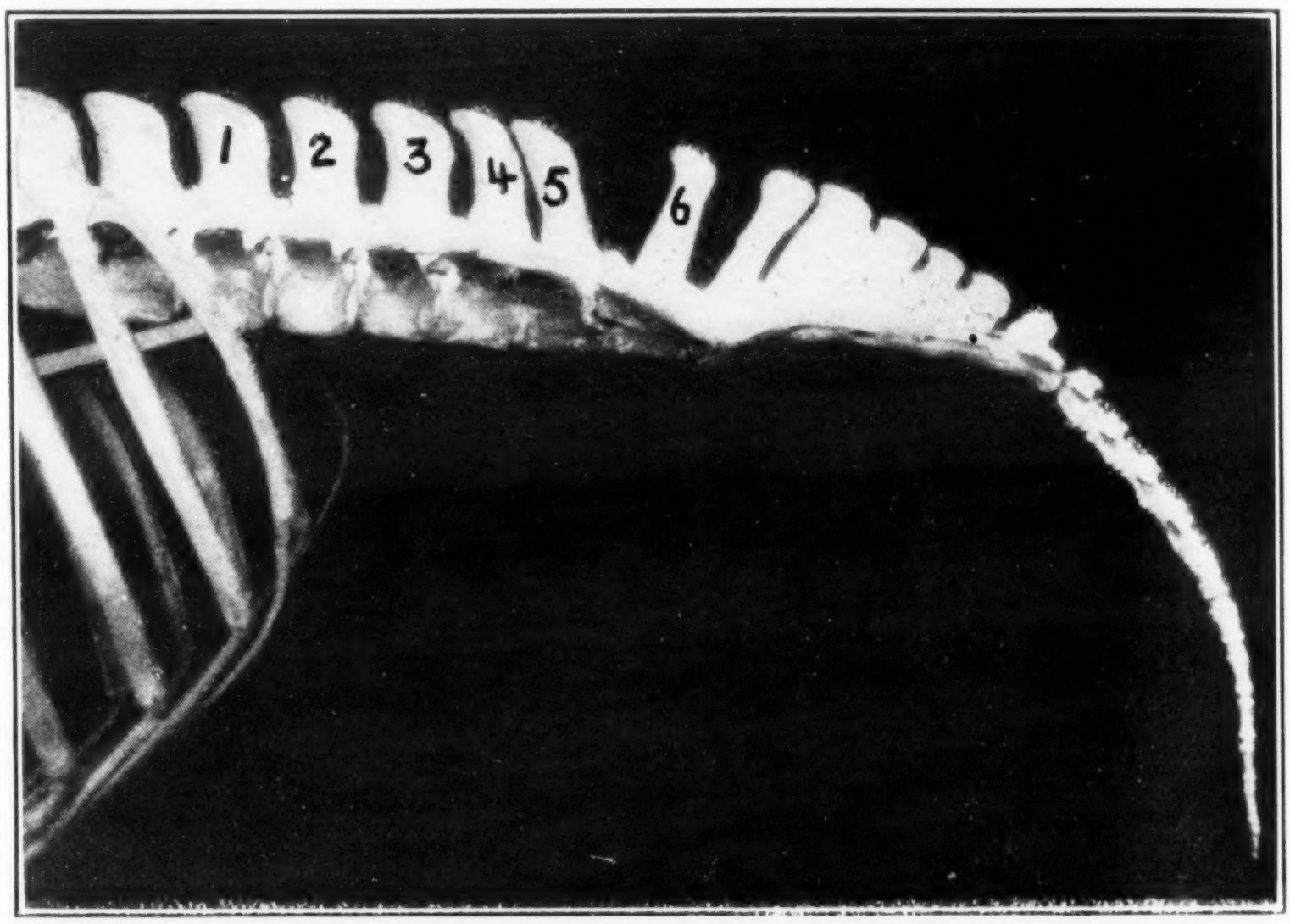

FIG. 11.—LEXINGTON.
Showing sixth lumbar vertebra of indeterminate character.

result is when the breeding is reversed, the mare being a pure Arab with her five lumbar vertebræ and the sire being some hybrid of the Forest horse. This question has not yet received an answer. I made one dissection of a foal of this breeding and found but five lumbar vertebræ; this dissection I have deposited, with its pedigree, in the Museum of Natural History of New York. There are in the United States half a dozen mares bred in this way from pure Arab dams and trotting stallions.

It seems to me important that these mares should be carefully bred, some to trotting sires and some to Arabs and the produce compared. Finally when the produce die, their backs should be dissected and if it be found that most of them have only five lumbar

vertebræ, then we may assume that the five-vertebræ structure is dominant when breeding hybrids from the dam of that type. We know it to be recessive, that is the six are asserted, when breeding hybrids by the use of the sire, as shown in Thoroughbreds examined. I shall illustrate this point in another way from known facts.

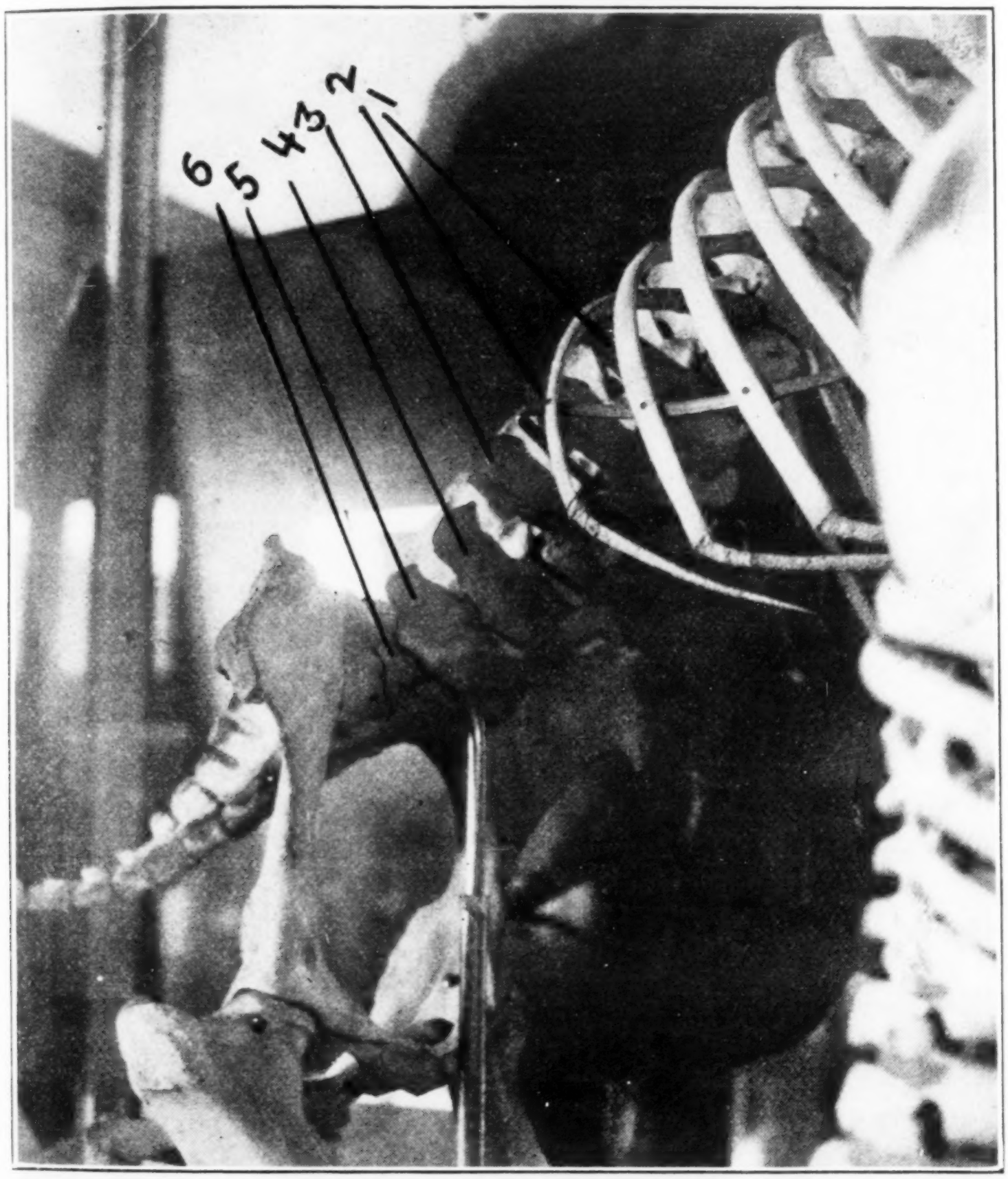

FIG. 12.—REARING HORSE OF UNKNOWN BREEDING.
Showing position of the sixth abortive vertebra, Museum of Natural History, New York.

When Professor Stejneger was travelling in western Norway he made a special investigation as to what proportion of the horses in common use had the callosities on their hind legs, and was not a little surprised to find that they were so commonly without them and that

where present they were extremely small, that is, the horses were relatively pure to the type of their Celtic pony ancestors.

The mixing with other types had of course gone on for centuries in a moderate degree, and probably during the last half century has been by use of sires of other types, yet the tendency has been in the direction of a stronger influence of the dam, and when callosities were present they were exceedingly small.

Now let us see what happens to the callosities when the ass, which has none on the hind legs, is bred to the mare which is possessed of them. The mule follows the female and nearly always has them. Thus again does the dam have the greater control over the physical characteristics, and callosities are dominant.

Shall we assume, then, that in breeding the pure Arab mare with five lumbar vertebræ to the horse that has six that the produce is more likely to follow the anatomy of the dam? Here is an opportunity to pursue an original line of research that will be productive of very beneficial results to horse breeders. Certain it is we want to breed for the best results and this is a line of investigation that if pursued seriously on parallel lines for a number of years will demonstrate a lot of things that we do not know at present.

The Arab breeders aways trace the pedigrees of their horses from the dam, and being also careful of the quality of the sires, have maintained purity of type in their horses.

I believe that it will be acknowledged by all breeders in America that those who give their greatest attention to the physical quality of their brood mares have the most uniform and highest quality of offspring. If it can be shown by following the line of anatomical research indicated above that the dam has a preponderance of influence over the anatomy of the foal, a more careful selection of dams will be adopted by breeders.

By following a system of registration that gives all prominence to the sire we have been misled into believing that the sire is the all-important consideration in breeding, and seriously uncertain have been the results in following this method.

I am told on good authority that in horse breeding Mendel's law is applicable only when breeding is within the family, and that is crossing species a new and unknown ratio of inheritance of characteristics is established. This I shall leave to others to work out, but before leaving the subject I should like to inquire of breeders what becomes of the callosities when a hinny is produced by breeding the stallion to the jennet. This has been done only occasionally, but

by analogy I am prepared to find that the callosities are very rarely transmitted to the offspring. Definite knowledge on the subject would certainly elucidate the argument.

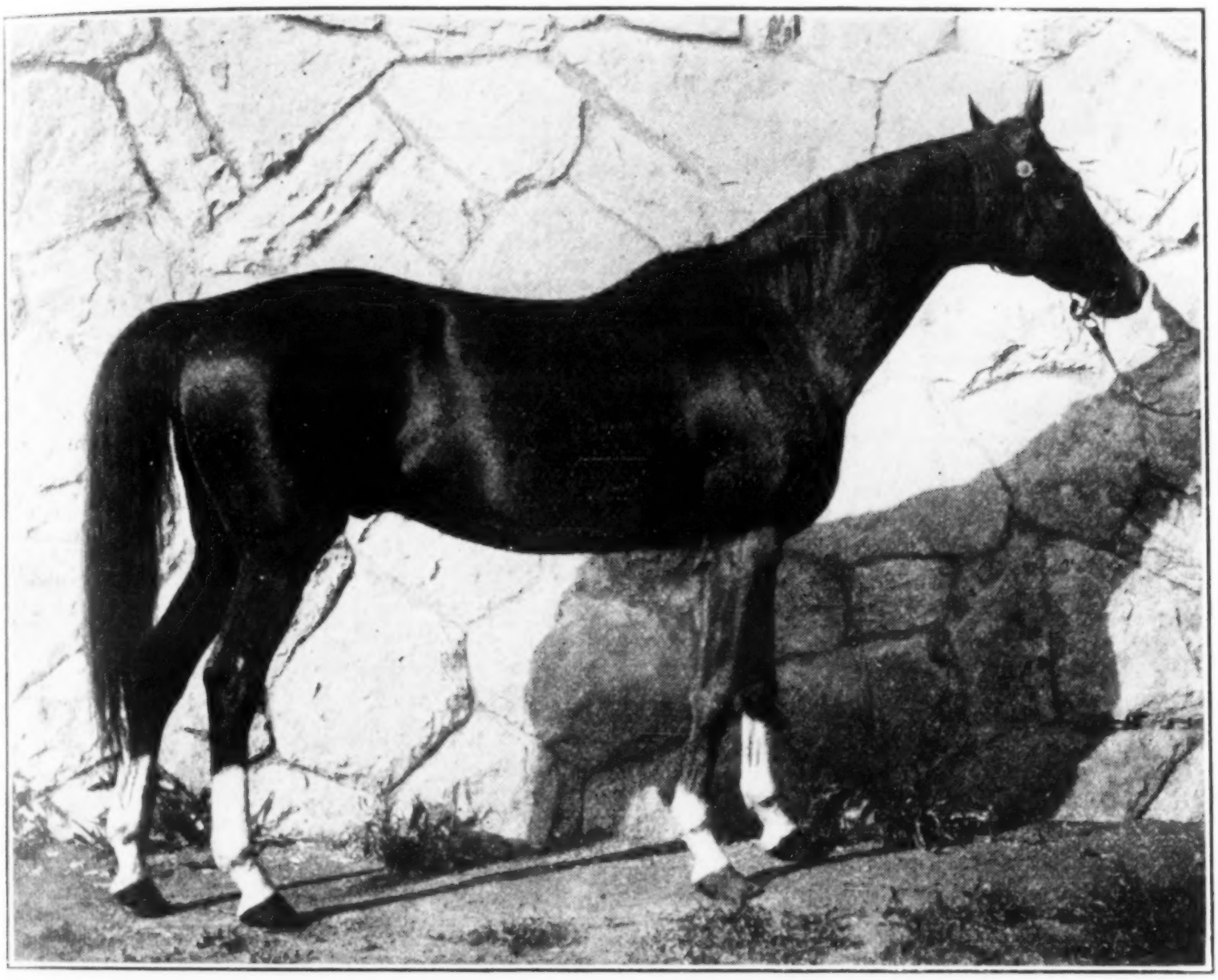

FIG. 13.—SALVATOR.
Imported Thoroughbred, showing Hogarth's line of beauty in neck.

[continuation in next number]

THE AGE FACTOR IN REGISTER-OF-MERIT JERSEYS

E. N. WENTWORTH
Iowa State College, Ames, Iowa

Some time ago, in connection with the various factors that influence maturity in animals, the age of parents at time of conception came under discussion. While there is little or no experimental evidence with respect to animals, yet the common practices of plant breeders in developing plants in more rigorous climates evoked the belief that youth in either parent at time of conception might modify the matu-

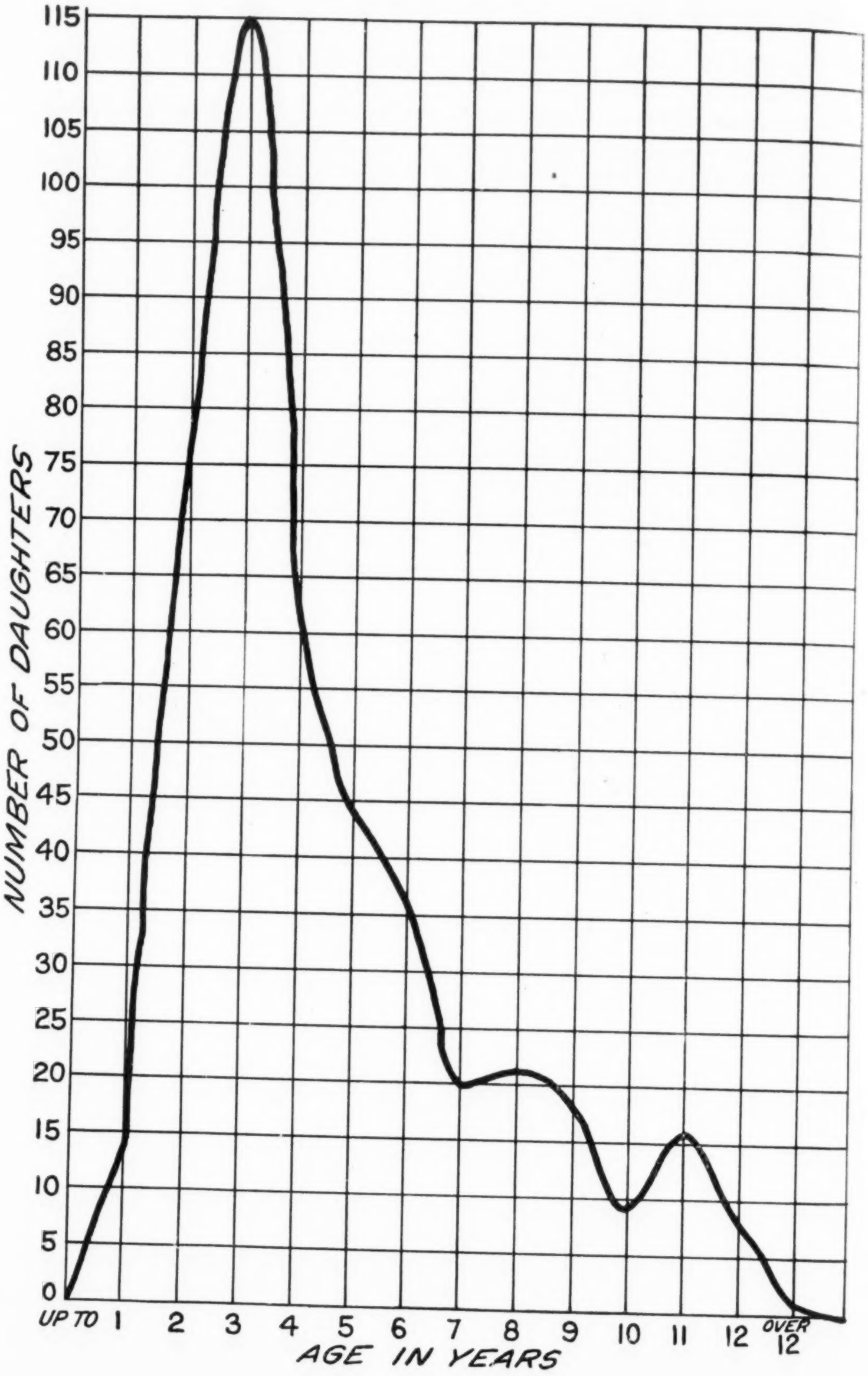

FIG. 1.—AGE OF SIRE IN RELATION TO NUMBER OF DAUGHTERS.

rity factor. With this idea in mind an examination of Jersey cows in the Register of Merit with reference to their sire's age was conducted and the curve in Fig. 1 plotted.

The result, to say the least, was surprising. While many breeders follow the practice of developing young bulls, yet it was surprising to discover that such a large percentage of the animals of the breed were the offspring of young animals. As can be plainly seen, 46.8 per cent of the animals were sired by bulls under three years of age, or nearly half of the number studied. In explanation of this it

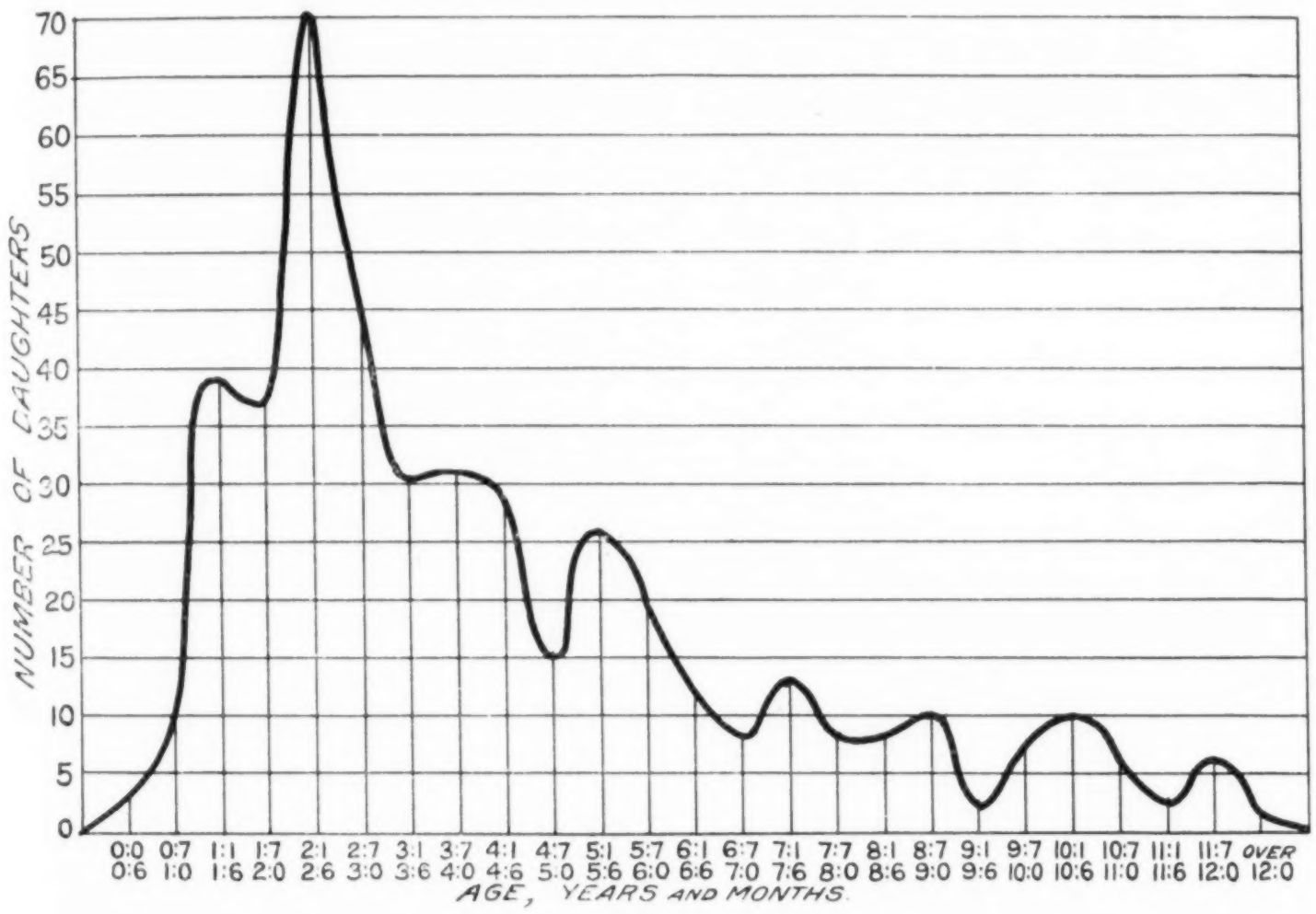

FIG. 2.—AGE OF SIRE IN RELATION TO NUMBER OF DAUGHTERS IN THE REGISTER OF MERIT.

has been said that breeders try a young bull and then sell him to men that do not put their females in the Register of Merit. While this may account for part it does not seem that all animals are thus answered for.

In order to study the distribution more thoroughly a second curve was plotted using a half year for the age unit rather than one year. This curve shows that 16 per cent of the total sires of the breed are from two years one month to two years six months old at time of service; 10.3 per cent are from two years seven months to three years. This is shown in curve, Fig. 2.

In order to compare the age of the sire with the age of his daughters at the time these made their record (the only index for maturity and that not absolutely satisfactory) a table was compiled which brought

to light an interesting fact. The average age of sires is four years and six months and the average age of daughters at time of record is the same. However, viewing this from the standpoint of the correlation coefficient the relation between variations in age is only casual, as a coefficient of ± 0.5269 is not high enough to suggest any marked relation. One factor which may modify this and which perhaps if omitted from figuring might produce a closer correspondence, is the fact that a bull comes to service at a much younger age than a cow comes to milking power. If these thirty-eight young bulls were left out, a much larger coefficient could be established. Another peculiar fact is that the modal age is the same, for both sire and daughter or, in other words, the typical age, 2 -$2\frac{1}{2}$ years, is the same both for service and for record making.

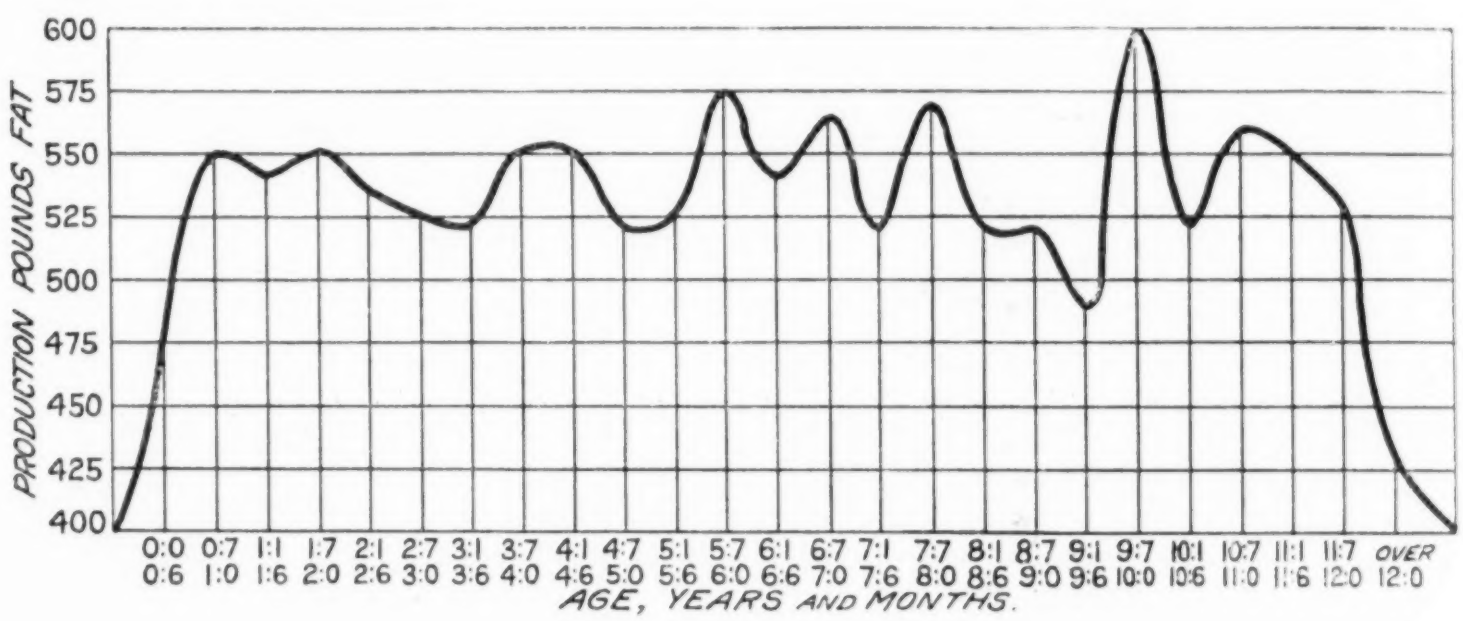

FIG. 3.—RELATION OF AGE OF SIRE TO PRODUCTION OF DAUGHTER.

The relation of age of sire to production of cow was tabulated, and a higher coefficient of correlation ± 0.6647 was found. The curve plotted from the table, however, shows very little of value, as only in the center of the curve is there found a strong tendency to positive correlation, a gradual increase in the curve (see fig. 3) in the younger ages being more than offset by a decrease in highest ages.

Next in order a table was compiled in which the production of the cows was all put on the same basis. Week records were discarded and only the year records and the three months records at St. Louis were considered. These latter were assumed to equal about two-fifths of the year's production, while the former were all put on a similar basis (that of the mature cow) from the standpoint of age. For example Brown Lassie's Prize 192584 made a record of 325 pounds 8.8 ounces, beginning at two years and two months old. The advanced registry requirement for that age is 250 pounds of butter-

fat in a year, while the requirement for a cow five years old or over (mature) is 400 pounds of butterfat. This difference in requirement is due to the increased capability of the cow as a producer when she matures. Then a record of 325 pounds of fat at two years two months is greater than the same record at five. To put these on a similar basis, direct proportion by means of the standards fixed by the American Jersey Cattle Club were used. Under this condition 325 pounds 8.8 ounces of fat in the "under thirty months" form equals 500 pounds 13 ounces in the mature form. Putting all records on this basis, the average production of all of the Jersey cows in the Register of Merit is 526 pounds 8 ounces.

Table 1 shows some interesting figures derived from this work. The sires have been divided equally into three groups, dividing the range of age into thirds, rather than grouping into equal numbers of sires. In only one case does the oldest group of sires lose anything to the younger, in spite of the larger number of younger animals. In average production the middle and younger sires have the advantage. In number of performers above the average in each group, and in relative early maturity of daughters, the younger and middle aged sires must yield to the older; as compore 523 pounds 7 ounces and 530 pounds 2 ounces with 513 pounds 15 ounces. In the case of maturity this is directly opposite to our plant breeder's experience. However, the relatively small number of old sires introduces a greater probable error, so great as to leave doubt in the mind as to the value of drawing conclusions.

In the course of the work one or two interesting facts came to light which are partial remuneration for the negative results of the preceding work. In the majority of cases there is a direct correlation between the high lactation period of the cow and the merit of calf which preceded this period. Presumably, however, this difference lies in the superabundance of vital force the cow possessed at this time and the energy thus transferred to the offspring.

Another fact which came out was the relatively large number of bulls which seemed to sire most of their Register of Merit daughters within one season. One can scarcely claim that the point needs explanation other than the ordinary factors of buying, selling, advertising, and the succession of a new bull as head of a herd of productive cows; yet the point is worthy of note, as it may be that in our highly artificially bred domestic cattle the greatest efficiency of reproduction is a sadly limited period.

TABLE 1.—*Three age-groups of sires with average production and age of respective groups of daughters.*

Age of sire.	Daughters.				
	Total number.	Number above average.	Per cent above average.	Average individual production.	Age at time of record.
yrs.mo. yrs.mo.			*per cent*	*lbs. ozs.*	*yrs. mos.*
0 : 0—0 : 6	3	0	0.00	471 : 1	5 : 5
0 : 7—1 : 0	9	4	44.44	532 : 11	4 : $2\frac{1}{9}$
1 : 1—1 : 6	26	10	38.46	546 : 8	4 : 7
1 : 7—2 : 0	27	15	55.55	533 : 5	4 : 1
2 : 1—2 : 6	54	21	38.88	519 : 0	4 : 2.5
2 : 7—3 : 0	31	9	29.03	507 : 1	4 : 9
3 : 1—3 : 6	26	8	30.77	509 : 14.4	4 : 4
3 : 7—4 : 0	23	11	47.83	536 : 15.5	6 : $\frac{5}{15}$
Average.....	.....	.....	39.2	523 : 7	4 : 7.4
Probable error..	.....	.....	±0.99	.....	.....
4 : 1—4 : 6	23	11	47.83	540 : 6.4	3 : 9
4 : 7—5 : 0	15	5	33.33	503 : 10	4 : 2
5 : 1—5 : 6	19	8	42.11	510 : 14.5	4 : 8
5 : 7—6 : 0	16	9	56.25	560 : 8	4 : 10
6 : 1—6 : 6	8	4	50.00	530 : 3	4 : 7.5
6 : 7—7 : 0	8	5	62.50	549 : 7.5	5 : 10
7 : 1—7 : 6	12	3	25.00	505 : 5	4 : 2
7 : 7—8 : 0	6	4	66.66	560 : 0	5 : 7
Average.....	.....	.....	45.80	530 : 2	4 : 6.3
Probable error..	.....	.....	±2.78	.....	.....
8 : 1— 8 : 6	7	2	28.57	514 : 4.8	3 : $1\frac{5}{7}$
8 : 7— 9 : 0	7	2	28.57	502 : 12	4 : 5
9 : 1— 9 : 6	2	1	54.00	499 : 15	3 : 8.5
9 : 7—10 : 0	5	4	80.00	430 : 4	4 : 4.6
10 : 1—10 : 6	10	3	30.00	511 : 12.7	3 : 6.5
10 : 7—11 : 0	7	5	71.43	592 : 38	4 : 1
11 : 1—11 : 6	2	1	50.00	535 : 12	3 : 6.5
11 : 7—12 : 0	6	4	66.66	522 : 3	4 : 4.6
over 12 : 1	1	0	00.00	412 : 0	2 : 0
Average.....	.....	.....	46.8	513 : 15	3 : 11.7
Probable error....	.....	.....	±5.70		
Total.....	353	149	42.21	.....	.....

Another interesting point lay in the relative influence in inheritance between the bull and the cow in the production of sons capable of siring Register of Merit daughters. Without transposing the records to the basis of the above work, a coefficient between the sire and son of 0.821 existed, while the transposed records gave a relationship of 0.862. Taking the latter relationship with the cow the coefficient 0.727 was derived. This would show a slightly stronger influence for the bull, but as the number of cases was smaller with the cows the

probable error would be enough larger to nearly neutralize this difference. This should set at rest the minds of many dairymen who believe that a dairy bull from a high performing cow is of more value as a sire than a bull whose daughters have proven worthy of registry. It furthermore brings a closer harmony with the theory of the equal potency of parents, something which practical men have hesitated to accept.

In conclusion it may be said that deductions from this work are practically impossible. While the introductory curves are somewhat surprising, a detailed study fails to show a strong correlation between any age of sire and maturity or production of the offspring. The premises may not be correctly taken, but it seems to the writer they are nearly enough so, to assure him of the lack of age as a factor in the conditions studied.

YIELD TESTS AS A BASIS OF AWARDING PRIZES AT CORN SHOWS

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The corn show has without doubt been an important factor in the development of interest in our principal crop. Competition is a powerful incentive, and encourages attention to details and minor differences that would be overlooked without this stimulus. In fostering competition, however, care should be taken that the competition is making in the direction of real improvement.

The avowed object in awarding prizes in corn contests is to give credit to the best exhibit of corn, that is, the exhibit of corn which it would be most profitable to grow[1] a worthy object which it would seem should eliminate from a score card any character not correlated with high performance.

At the time that score card methods were applied to corn judging, almost nothing was known regarding those characters of the ear which are associated with high yield. In the absence of experimental data the choice of points would seem to have been based on the idea that the size of the cob was fixed and the best ear was the one that approached the nearest to the maximum amount of grain that could

[1] See Bowman and Crossley, Corn, p. 406, and Ohio Agricultural Experiment Station Circulars Nos. 43, 61, etc.

be placed on the cob. Hence the straight rows, the cylindrical ear, the wedge-shaped grain, the rounded butt and tip, and the recapitulation of all these in the per cent of grain to cob. In only a few cases have the values of these characters been put to the test, but what evidence there is seems to indicate that most of the score card characters have nothing whatever to do with yield and some of them seem to be actually correlated with low yields, instead of high yields.

Competitive corn shows simply adopted methods already in use with live stock, fruit, flower, and vegetable exhibitions. With these products appearance is closely associated with market value, while in corn appearance is of little importance, a fact which made the older methods more or less inapplicable.

A further distinction between corn and most of the earlier classes of exhibits is the fact that corn is an annual. With live stock and perennial plants, though conformity to a score card may not indicate a high degree of commercial superiority, there is at least the satisfaction of having a beautiful and relatively perfect animal that continues to be a pleasure year after year. But with corn the pleasure derived from the production of prize-winning ears is very short-lived, unless they are kept as decorations or mementos of victory.

The repeated demonstration that the characters used as the basis of scoring stand in no definite relation to performance has caused a widespread reaction against the present method of awarding prizes. In recent years the attempt has been made to meet the difficulty by awarding prizes for the largest yield per acre, but this is not proving satisfactory. Profit and not yield per acre is the object of the farmer. The premium in such cases might with equal propriety be awarded for the best fertilizer or the most productive land. In a few cases prizes have been offered for the greatest net return per acre, but the opportunities for deception are so tempting and the difficulties of securing accurate data are so great, that competitions of this kind are not likely to become popular. Furthermore, profit per acre does not center the attention on the improvement of the corn, and while increased profits are desirable, such an exhibit should be called a competition in farm management and not a corn show, the object of which is the improvement of corn varieties.

The real difficulty would seem to lie in the attempt to combine the awarding of prizes to handsome ears and high yielding ears at the same time. Confusion and dissatisfaction will continue until the two objects are recognized as distinct and prizes are awarded accordingly.

There would seem to be no reason why there should not be corn fanciers as well an fanciers of live stock, but let us not confuse the appearance of the ear with its value as seed. If the judging of corn on the appearance of the ear can once be separated from the attempt to recognize its value as seed, the score card can be freed from such vague and meaningless terms as "breediness" and "constitution," and the judging can be based on definite characters capable of accurate application.

To secure the full advantages of competition in the improvement of corn varieties, it will be necessary to provide a class, in which a premium is awarded to the exhibit, *capable of producing the largest amount of marketable corn under given conditions.*

A suggestion that premiums be awarded for high-yielding strains of corn has been made by Mr. D. A. Saunders, special agent of the Department of Agriculture in Texas. It seems to obviate most of the objections to present systems, and while retaining the advantages of competition would cause it to bear directly on the improvement of corn varieties. The method is certainly worthy of careful consideration by corn growers' associations and other organizations interested in the improvement of corn.

One way to utilize this suggestion is that the corn growers' association, or whatever organization is managing the competition, arrange with the state experiment station or nearest branch station to plant seed from each of the entries in a comparative yield test, the award to be made to the exhibit producing the highest yield. The exhibits would need to be submitted in the spring in time for planting and should consist of ten ears. One-half the number could be taken at random, the seed shelled and thoroughly mixed before planting.

The test could be made by planting a single row from each lot and repeating the series three or four times, a method that is proving more satisfactory than that of planting in plats. In this way the area required for testing the exhibits of an entire show would not be large. With rows 100 feet in length and repeating the series four times at least twenty-five exhibits could be tested on an acre.

The date of harvesting could be announced and the exhibitors and all others interested could be invited to attend when the corn is harvested. The general appearance of the crop as well as the characters of the plants could then be observed.

The corn should then be stored and the final weighing made at the time of holding the show. This would take place at the usual time,

when the corn would all be air-dry and the yields comparable. The five ears remaining of each of the original entries could then be placed on exhibition, with a statement of the yield.

The educational value of an exhibit of this kind would be much greater than that of the conventional form. The grower would have the opportunity to see exactly how his corn had behaved in comparison with other varieties. Significant characteristics of the high-yielding strains would be apparent and readily brought home to the actual breeders and growers.

Objection might be raised on the ground that a test made at one place can not do justice to all the exhibits, some of which may have been bred on soil of a different type, or that the planting distance chosen for the yield test is not the best for all the varieties contesting. The same objections apply to all yield tests, yet a yield test is the only method at present available for determining the relative values of different varieties and for measuring the results of breeding. As a criterion for awarding prizes the injustice is certainly less than the present system of score card ratings. The yield test shows that the exhibit awarded first place is really superior to its competitors under at least one set of conditions, while conformity to the arbitrary standard of a score card bears no relation to the performance of the strain under any conditions.

Experiment stations would doubtless welcome the opportunity of making these tests for corn exhibitions, since it affords an excellent means of bringing the farmer and breeder into close touch with the work of the station. If the station has an improved or new variety of corn which it desires to introduce into general use it could be included in the series tested. Though not entered for a premium, any variety that possessed real merit would have attention called to it in a most effective way.

Local associations whose exhibitions are held at places where no station or substation is available for growing the exhibits should have little difficulty in securing the use of sufficient land for the test from private individuals. In such cases it would be necessary that the planting, harvesting, and weighing be done by representatives of the association. The corn, as soon as the yields were determined, could revert to the farmer in return for the use of the land.

REPORT ON THE ORGANIZATION AND THE FIRST EIGHT MONTHS' WORK OF THE EUGENICS RECORD OFFICE

H. H. Laughlin
Cold Spring Harbor, N. Y.

The Eugenics Record Office began work at Cold Spring Harbor, Long Island, on the first of October, 1910. Preparatory to this, however, Dr. Davenport and the writer had trained a class of twelve persons for the duties of field workers. Among other things the work included instruction in the principles of heredity, the distinction between worthless and telling records, and the practical methods of gathering significant data at first hand in the field. The work was novel in the history of training field workers, in that they were trained for the purpose of observing keenly and reporting accurately the facts concerning the family distribution of specific biological traits in human families. This was done because it is now generally recognized that the rapid advance in discovering the laws governing the inheritance of mental and physical traits is due to two things: First, the modern field method of getting at the inheritance distribution of biological facts, and, second, the modern analytical study of these facts, fitting them to the presence-and-absence hypothesis and to the Mendelian principles.

Six of these field workers were retained in the service of the Record Office, as follows:

Miss Florence H. Danielson was assigned to the collection of pedigrees of epileptic families in Massachusetts and Connecticut, under the immediate supervision of Dr. Everitt Flood at Palm ., Mass. Up to the present time she has sent the office 95 pages of charted pedigrees and 286 pages of descriptions. Her work is of special interest in that the families studied are closely related, thus furnishing many samples of a single germ plasm. It is from just such extended pedigrees that the laws of heredity are best ascertained.

Miss Saidee C. Devitt was assigned the duty of working up the pedigrees of epileptic families in New Jersey under the direction of Dr. David B. Weeks of the Skillman School for Epileptics. Miss Devitt has sent in 50 pages of pedigrees and 128 of descriptions.

Mrs. Mary Drange-Graebe was assigned to the study of the transmission of criminal traits, under the immediate care of Dr. William Healy of the Chicago Psychopathic Institute. After four months' work there she began her present assignment—the study of the Ish-

mael Tribe in and about Indianapolis, Ind. This tribe of vagabonds came up from Kentucky into Indiana just a little in advance of the more settled conditions. A generation ago, Dr. Oscar McCulloch, assisted by Mrs. Kate Parker and a Mr. J. F. Wright, began the study of this tribe in just such a manner as the field workers of today are following; the work, however, was too advanced for the times. Dr. McCulloch died and Mrs. Parker found it impossible to continue the work. The original notes were mostly destroyed, a single large volume of pedigrees remaining. This volume Mrs. Parker has turned over to the Record Office, and now Mrs. Graebe will take up the work where it was dropped a generation ago. Up to the present time Mrs. Graebe has sent in 77 pages of pedigrees and 873 pages of descriptions. The traveling expenses for this work are paid for by Mr. W. E. D. Stokes.

Miss Amey B. Eaton, working directly from the Record Office, was assigned to the study of the Amish Sect of Lancaster County, Penn. In this small sect considerable intermarriage has occurred. These people kindly coöperated in our efforts to learn whether, and if so to what extent, these consanguineous marriages had resulted in defective offspring. In her second assignment Miss Eaton catalogued genealogies in the New York Public Library with a view to locating those that record the transmission of specific mental and physical traits. The thing made apparent by this study as far as it has progressed is, that, in the hundreds of genealogies published, there is too little material of use to the eugenist. It may be that at some future time it will become fashionable for genealogies to give in detail a statement of inheritable traits in addition to the names and dates of marriages, births and deaths and the family traditions. Her next assignment was the making of a bibliography of the literature on Huntington's Chorea. Miss Eaton has sent to the office 293 pages of pedigrees and 731 pages of descriptions. At present she is assigned to the duties of editorial secretary at the Record Office.

Dr. A. H. Estabrook was first assigned to western Massachusetts and Connecticut to collect pedigrees of albino families. His second assignment was the study of the factors of heredity contributing to criminal insanity; he was attached to the Matteawan State Asylum at Matteawan, N. Y. He is now working on his third assignment—the study of degenerates in the isolated valleys around the upper Hudson. He has reported the discovery there of a large family with much intermarriage that promises to be as interesting as the "Juke "or the "Zero" family. Dr. Estabrook has sent to the office 35 pages of pedigrees and 168 pages of descriptions.

Miss Helen T. Reeves was assiged to the study of feeble-mindedness in New Jersey under the direction of Dr. H. H. Goddard and was later transferred to the same problem under the direction of Dr. Hallowell of the New Jersey State Home for Feeble-minded Women. At present she is working on an extended network that promises to be very significant: she has sent to the office 76 pages of pedigrees and 84 pages of descriptions.

A tabulation of the field expenses, exclusive of salary and fifteen days' maintenance at the institution from which they work, shows that the average field expense of the work is $54.

In addition to the twelve persons trained during the summer of 1910 for positions as field workers, four others have since received the same training: Miss Moore, sometimes archivist of the Record Office, Miss Sturges, Miss Jones, and Miss Orr. Three of these have received appointments with different institutions. Our own six field workers were selected from the twelve above mentioned. These field workers make a daily report as to their present addresses, their addresses three days hence, their work of the day and their outlook for the next day, and they also send the office a general monthly prospect. Their pedigree charts and descriptive notes are sent to the office for criticism from time to time, and filed at the office upon completion of the record of a single family or tribe. Specially ruled note books with alternating white and yellow sheets—the white detachable—were prepared for the field workers' use, and also note books for written descriptions, similarly bound, were prepared.

Preparatory to a study that it is planned to make in collaboration with Dr. S. E. Jelliffe of the immigration sources, the migration r_utes, and the specific behavior in heredity of Huntington's Chorea, this office has collected through the collaboration of the various hospitals of the country, pedigree records of 80 families suffering from this disease.

The Record Office has addressed letters to all of the heads of all institutions in the United States concerned with abnormal individuals, inquiring to what extent modern field work is being carried on and to what extent collaboration and exchange of data with the Record Office is feasible and desirable. The replies have been of a most gratifying nature, as the heads of the institutions generally recognize that the time is ripe for a concerted study looking to the discovery of the causes of defects and the circumscribing of the affected germ plasm. The need of a clearing house is made apparent by the fact that from time to time the pedigrees begun by eastern investigators come to an abrupt

end by simply stating that the family moved to such and such a western State at such and such a time. Those in charge of the western institutions, while taking more than average interest in the movement, realize that in their country, because newly settled, the tabulation of extended pedigrees is usually impossible; they feel that pedigrees begun by their investigators will end before progressing very far by simply recording: "Further history unobtainable, family came from such and such an eastern place at such and such a time."

The work of the Record Office is not confined to the study of abnormal traits, interesting as these may be in throwing light on the principles of heredity and in discovering the laws that will lead to the prevention of the production of defective persons, but it also includes the study of men of genius and to this end a schedule has been prepared, which will be sent to any persons in the United States who have developed special talents in some direction and who care to coöperate in the investigation to the extent of supplying their own biological history.

The Record Office has begun a cross-reference index of the names, traits, and localities included in all the data received. It is believed that this index will be useful in tying together fragmentary pedigrees and in tracing back to the earliest ancestor significant hereditary traits. The office is now prepared to index any material, no matter how fragmentary or how extensive, concerning the transmission of biological traits in man; and it seeks to become the depository of such material.

The heads of the State institutions in New Jersey, New York, Massachusetts, Connecticut, Wisconsin, Michigan and Illinois (in so far as they are not now making investigations in heredity) have by their replies indicated that conditions in these States are such as to warrant the employment of field workers in the near future. Other States, while looking with favor on the movement and desiring to coöperate, feel that the time is not quite ripe for application to the legislatures for the necessary funds.

Provisions have just been made for the publication of the Eugenics Record Office Bulletin, which will consist of brief papers by investigators in eugenics and will for the most part be based on facts gathered in the modern way by the field workers of and collaborators with the Record Office. Bulletin No. 1: Heredity of Feeble-mindedness, by Dr. H. H. Goodard, was issued in March, and Bulletin No. 2, The Study of Human Heredity, methods of collecting, charting and analyzing data, by C. B. Davenport, H. H. Laughlin, David F.

Weeks, E. R. Johnstone and Henry H. Goodard, was issued in June. Bulletin No. 3, by Gertrude L. Cannon and A. T. Rosanoff is entitled: Preliminary Report of a Study of the Heredity of Insanity in the light of Mendelian laws. It is the intention to use these bulletins, to show the heads of institutions, boards of control, private investigators, genealogists, and legislative authorities just what can be done and is being done by the modern methods of investigation. It is hoped to arouse the conviction that data, adequate to the deduction of the laws of inheritance, and studies preliminary to wise legislation looking to the prevention of the production of defectives, can be got only by sending trained field workers into the home territories of the families studied, and to bring it about that the board of control of each State institution shall maintain one or more such workers on its staff. The movement is progressing very satisfactorily indeed.

The "Family Records" and "Record of Family Traits" schedules are being distributed to persons who will undertake to fill them out and deposit them at this office. Over 7000 of these have been placed with genealogists, teachers of biology, and other interested persons most able and likely to fill them out. Forms calling for data on the inheritance of factors contributing to mathematical ability have been prepared and are now being distributed; the principal collaborator in this work is Prof. H. Clay Harvey. Also forms of the same nature but somewhat more detailed have been prepared for the study of the inheritance of musical ability. The factors most likely to be contributory to the contraction of tuberculosis have been charted, and schedules calling for the family history of these particulars have been printed; about 2000 of them have already been placed. Dr. A. E. Kepford, the State Tuberculosis Lecturer of Iowa, is actively collaborating in this work, and favorable replies have been received from State sanitaria and private persons looking to the collection of authentic pedigrees that will enable careful study to be made of the behavior of hereditary resistance and non-resistance to this disease.

Correspondence, seeking to locate the original notes of the late R. L. Dugdale—which notes he made while gathering data as a basis for his book on the "Jukes"—has been carried on. After hearing from all his executors and from all associates in his work that are still living, we are convinced that his manuscript was destroyed upon the death of his sister in 1884. However, the original prison records exist and the Record Office will shortly take up the work where Dugdale left off. It is known, that many other Juke-like families exist, and our field workers' reports assure us that many such pedi-

grees can be worked out. The work of Dugdale on the "Jukes," like the work of McCulloch on the "Ishmaels," was a generation ahead of its time.

The purpose of the Record Office is the collection of data adequate to the determination of the laws of inheritance; to be a clearing house in matters pertaining to human heredity; to aid in the extension of the knowledge of the laws of inheritance as these laws are discovered from time to time, to the end that the propagation of defectives may be stopped and the more talented strains may be measurably increased. The work of the first months has consisted in organizing and directing a small field force, trained according to the new ideals; in working out an indexing system making all data possessed by the office instantly accessible; in ascertaining the attitude of institutions and interested persons toward the new investigations and the feasibility of coöperation; and in securing pedigree records of specific mental and physical traits.

The office is situated about three-quarters of a mile from the Station for Experimental Evolution (a department of the Carnegie Institution of Washington) on the State Road leading from Cold Spring Harbor to Syosset, a station on the Long Island Railroad about two and one-half miles distant; the office is about equally distant from Oyster Bay. The main room is 17 feet by 38 feet and a fireproof concrete and steel record room, 14 feet by 17 feet, adjoining the office, is just being completed. Files and indexing material are being supplied as rapidly as needed and an adequate office force is maintained.

THE INHERITANCE OF LEFT-HANDEDNESS

[CONTINUED FROM FIRST QUARTER]

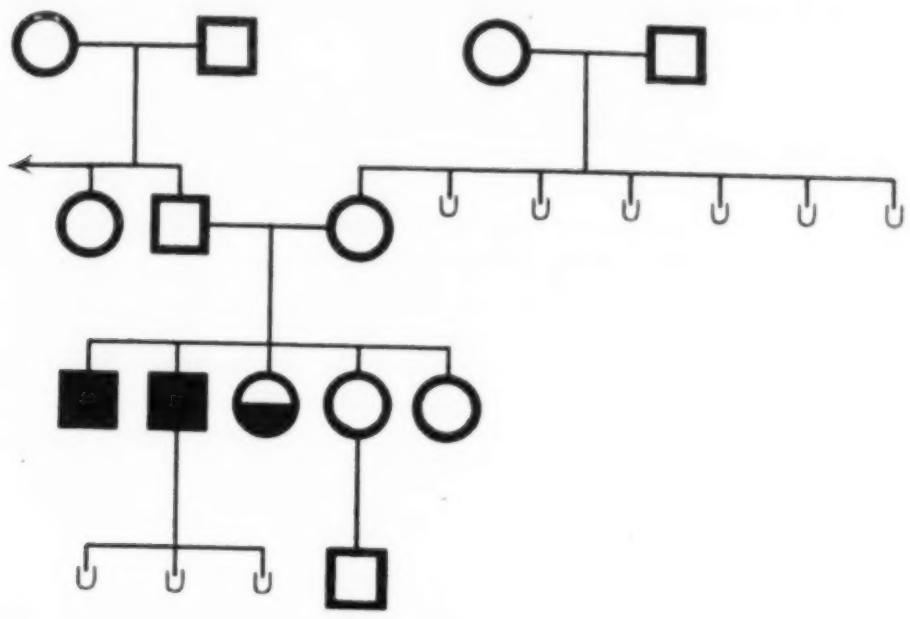

FIG. 3

Fig. 3. Here the childship shows a majority of affected persons.[3] The female is ambidextrous. This family has taken an intelligent interest in the appearance of this variation among the children. The mother assures me that she was never able to learn of any case of left-handedness either in her ancestry or that of her husband. The variation here seems to have arisen spontaneously and in more than half the children.

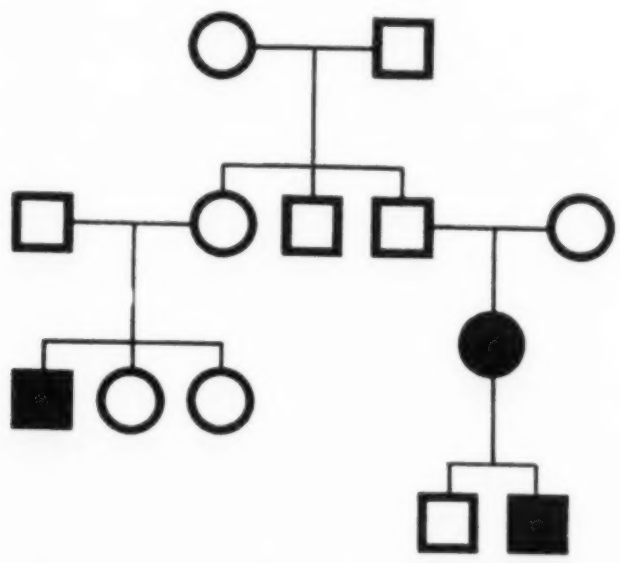

FIG. 4

Fig. 4. This family history indicates that brother and sister were carriers of a latent factor of left-handedness, which characteristic became patent in their children. A Mendelian interpretation here demands that both parents in the two families concerned should

[3] The following symbols are used in the heredity charts: male, right-handed; female, right-handed; male, left-handed; female, left-handed; male, ambidextrous; female, ambidextrous; sex unknown, right handed; sex unknown, left-handed.

have been heterozygous with respect to the factors that determine preference for use of one or the other hand. Possibly many so-called right-handed individuals are heterozygous in regard to these factors.

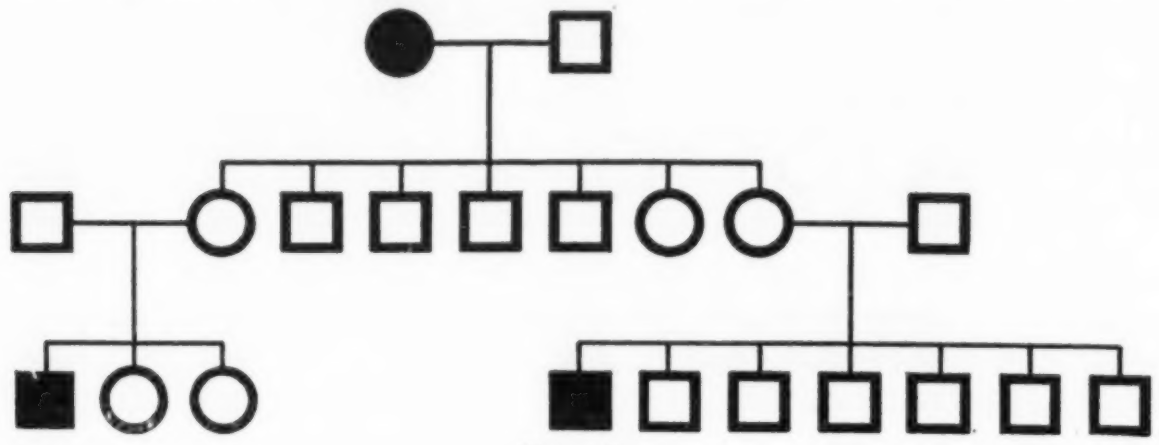

FIG. 5

Fig. 5. Here again two individuals (females in this case) appear to have acted as carriers of a factor transmitted from the father and through them to their children. If we assume here, as we must on a Mendelian stand, that the mother was homozygous with respect to the left-handed character and the father either homo- or heterozygous with respect to the other member of the assumed pair of allelomorphs, the absence of left-handedness in the second generation is disconcerting but not necessarily subversive of the Mendelian scheme. Assuming again that both parents of the two third-generation childships are heterozygous, the appearance of a left-handed child in each meets a reasonable Mendelian expectation.

As an example of the range of data gathered in every case where possible, the following account of the male of the smaller childship will suffice: Throws ball with left hand; kicks football with left foot; uses knife and fork as do right-handed persons, but holds spoon in the left hand; writes with right hand (though he began to use left, but was forced to change to right by teachers in lower grades of school); shoots gun from left shoulder; shoots marbles with left hand; bats ball from right side of plate; holds drinking glass with right hand; holds pencil on left ear; plays tennis with left hand; starts on running track with right foot at line.

Many other cases simply parallel this one with unimportant variations. The point to be emphasized here is a condition of general left-sidedness (especially left-leggedness, contrary to Sibley's equilibrium theory) coincident with left-handedness.

Fig. 6. The affected individual here is a professor who has taken a deep interest in his own condition and that of his daughter (both inveterately left-handed) and has made a scientific study of the ancestry of himself and wife. He assures me that for three generations

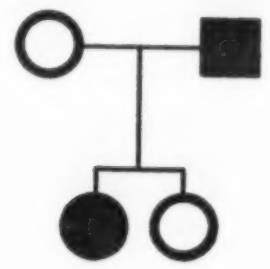

FIG. 6

back on his side and two generations back in his wife's ancestry no left-handedness has anywhere appeared. Here again seems to be a real case of a mutation (spontaneous variation) which again appeared in one of the two offspring.

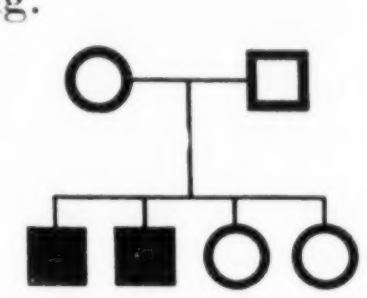

FIG. 7

Fig. 7. This case is interesting in that half the childship (the two halves of opposite sex)[4] of apparently unaffected parents are left-handed. The family explains the case by the fact that the boys had a left-handed nurse, the girls a different nurse.

Thus far, then, we seem to have discovered the influence of at least three factors in the production of left-handed individuals (the condition being probably of at least three degrees or grades of intensity): (1) heredity; (2) spontaneous variation; (3) imitation. More will be said of these three types below.

FIG. 8

Fig. 8. This pedigree shows direct transmission through three generations.

[4] In each of four other childships (comprising a total of 11 girls and 8 boys), which have since come to my notice, the left-handed individuals are all of the same sex (three females each in three cases).

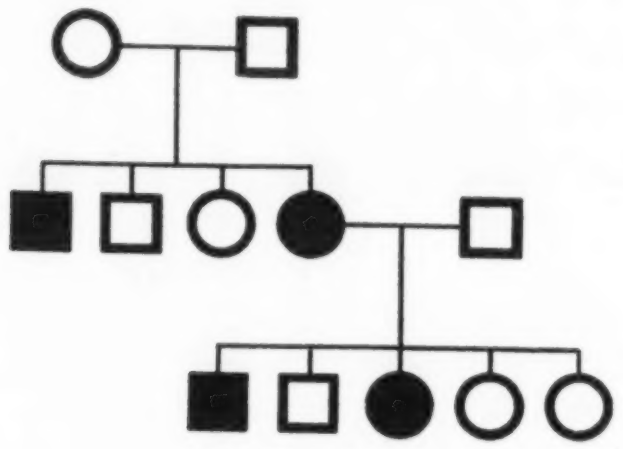

FIG. 9

Fig. 9. This shows the prevalence of left-handedness in a particular family to the extent of approximately half the childship. Having recognized a factor of imitation, the argument might be made that the prevalence of left-handedness in certain families is due to the operation of this factor exclusive of heredity. I am convinced that this is not a valid argument. Families (at least of whites) where left-handedness has appeared make very vigorous efforts to repress a similar tendency in new members.

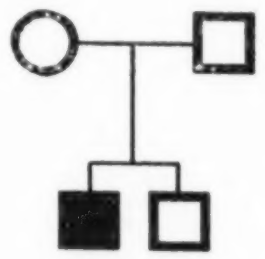

FIG. 10

Fig. 10. This case is interesting from the fact that the childship here is a pair of identical twins. Such twins (the result most probably of an independent development of each blastomere of the two-cell stage) may be partially 'mirror images' of each other, as appears here to be the case regarding the use of the hand and possibly its anatomical basis. However, an attempt to verify this hypothesis has failed. Four other pairs of identical twins (so adjudged on grounds of superficial similarity) are now known to me in all of which both members are right-handed.

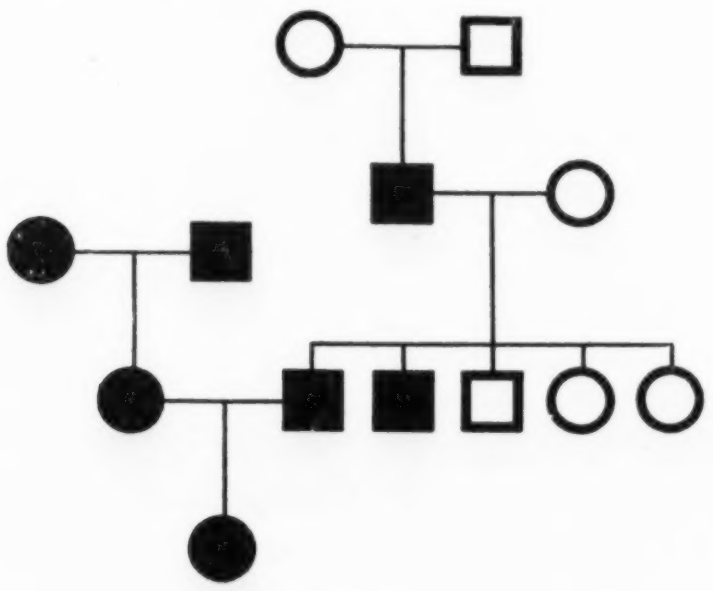

FIG. 11

Fig. 11. This case is most important in that the variation in question is very general. Three months ago I knew only the history up to the last generation represented. The child of this generation was too young to have shown any decided tendency one way or the other. Judging from the family histories, one would expect the mother to be homozygous and the father to be heterozygous (imperfect dominant). If this were so at least half of the children of the family should be left-handed. I have just received a letter from the father stating that the child is "decidedly left-handed." This case alone, I believe, justifies this limited collection of data. Families like this one, if fully recorded at some central office and followed during future years, may yield important information regarding the hereditary transmission of human characteristics in general.

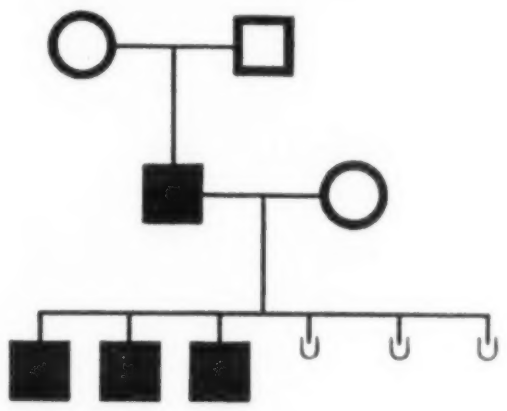

FIG. 12

Fig. 12. This case is interesting again in that the childship of six is equally divided between affected and unaffected individuals.

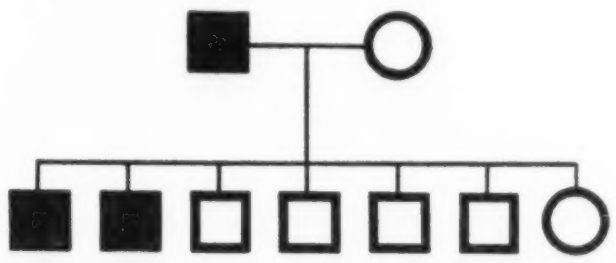

FIG. 13

Fig. 13. The history of this case was kindly supplied to me by Dr. W. Thalhimer (instructor in pathology). It gives additional proof for the hypothesis that in left-handed individuals the controlling center is located in the right hemisphere (instead of the left as in right-handed persons).

In 1861 M. Broca definitely assigned the posterior part of the third frontal convolution of the left hemisphere as the seat of articulate speech. Accordingly ataxic aphasia ordinarily occurs in association with right-handed hemiplegia. This case shows that in a left-handed individual the reverse condition obtains. In brief,

this man (he has two left-handed children) developed a complete left-sided hemiplegia coincident with a complete motor aphasia. Dr. Thalhimer's notes are in part as follows: "The correlation of left hemiplegia—indicating a right-sided cerebral lesion and aphasia—suggested a contralateral displacement of Broca's motor speech area, and this suggested a contralateral displacement of normal right-sided functions, and it was immediately discovered on questioning the patient's family that he was and always had been left-handed."

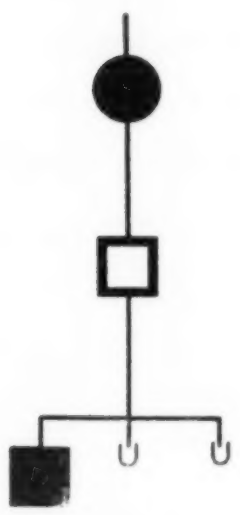

FIG. 14

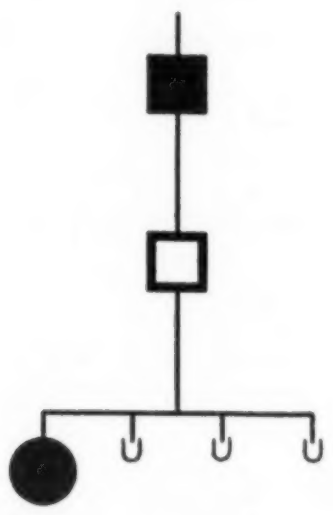

FIG. 15

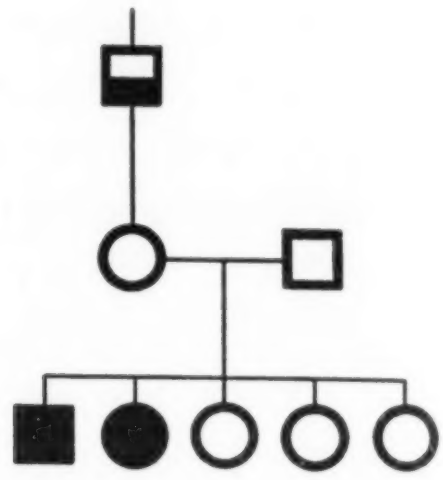

FIG. 16

Fig. 14, 15, and 16 again show a carrier in the second generation given.

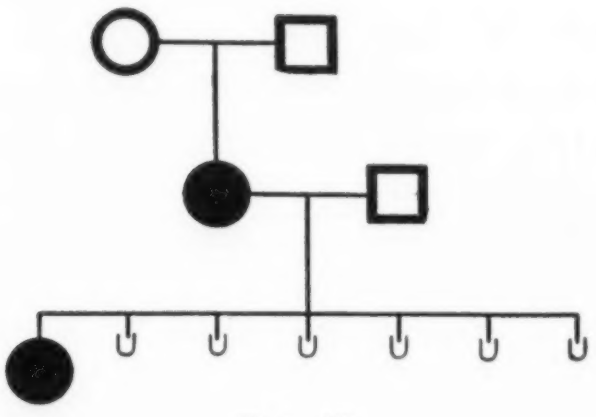

FIG. 17

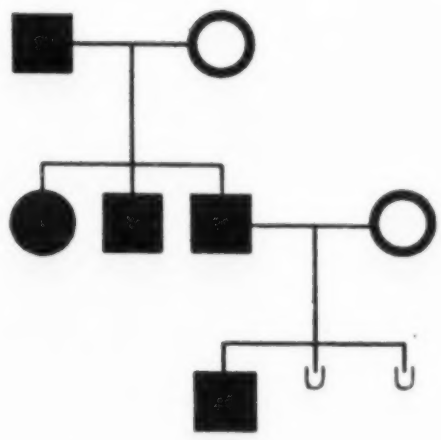

FIG. 18

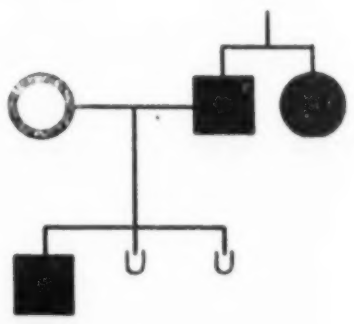

FIG. 20

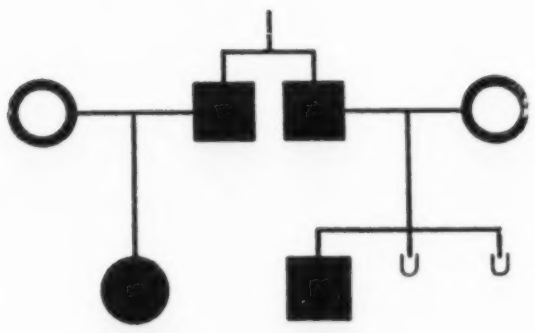

FIG. 19

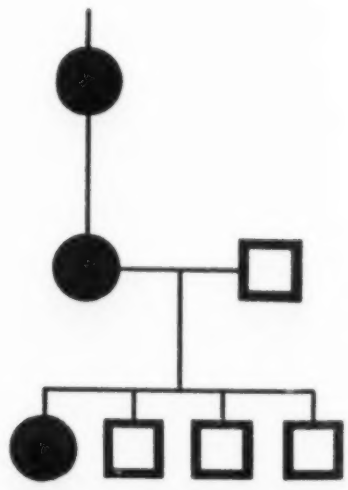

FIG. 21

Figs. 17, 18, 19, 20, and 21 again show direct transmission.

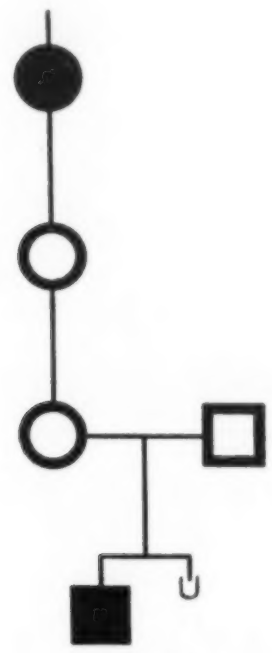

FIG. 22

Fig. 22 seems to show the influence of a great-grandmother carried "latent" in the direct line through two intermediate generations.

FIG. 23

Fig. 23 shows transmission of this character through four successive generations, the last represented by an only son.

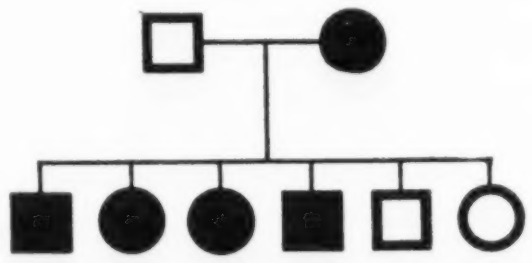

FIG. 24

Fig. 24 (colored) is interesting as a case where a left-handed mother and a right-handed father have four left-handed children in a family of six. This is the "John" family discussed in the Davenports' article on "Heredity of the Skin Pigmentation in Man."

STATEMENTS OF RESULTS

Among the left-handed university students, six (all inveterate) said they were the only persons so affected among all their connections. This testimony together with cases Nos. 9 and 4 leaves no doubt, I believe, that left-handedness often arises spontaneously. Case No. 9 again shows that such mutation or variation is hereditary.

Tabulating the childships of four or more individuals, the proportion of left-handedness to right-handedness is as $1:1\frac{1}{2}$.

CASE NO.	●	■	○	□	⏚	⏚
2	—1	1	1	1		
3	—1	2	2			
5	—	1		6		
7	—	2	2			
9	1	1	1	1		
	1	1	2	1		
11	—	2	2	1		
12	—	3			3	
13	—	2	1	3		
Total	4	15	11	13	3	
		19		27		

The ratio of 16 left-handed students to a total body of 700 is about $2\frac{1}{3}$ per cent.

Among the white pupils of the public school the proportion of left-handed to right-handed in affected families is as 39 to 79 or as 1 to 2. There is no evidence to support the opinion of some (*e.g.*, Weber) that left-handedness is more prevalent among women. The proportion of affected males to females is as 1 to 1. This school is represented by 604 males and 794 females (1,394). Thirty left-handed pupils here represent a ratio of about $2\frac{1}{6}$ per cent, agreeing with the ratio for university students and Hyrtl's result for European peoples in general.

Summarizing the foregoing 49[5] white families in terms of heredity, we find the following modes of "transmission" represented in the frequency indicated:

[5] Including three families besides those of university students (16) and public school pupils (30).

		Number of Case
1.	From grandmother to granddaughter	1
2.	From grandmother to grandson	4
3.	From grandfather to granddaughter	3
4.	From grandfather to grandson	1
5.	From mother to daughter	3
6.	From mother to son	4
7.	From father to daughter	2
8.	From father to son	7

The following is a summary of the chief facts gathered from 29 colored childships: (a) In 5 cases either an uncle or an aunt is left-handed; (b) in 7 cases one parent is left-handed; (c) in 17 cases neither parent is left-handed; (d) proportion of left-handed individuals to right-handed is as 29 to 25; (e) the 29 school children included 15 males and 14 females; including the whole childship the proportion of affected males to affected females is as 17 to 18; including parents, uncles and aunts the proportion is 21 to 25; (f) the colored pupils included 287 males and 381 females (668); the 29 left handed pupils thus represent $4\frac{1}{3}$ per cent.

In the three sets of data the proportion of left-handed males to left-handed females is approximately equal. The proportion of left-handed colored children to right-handed (29 to 25) as shown in the above colored childships is probably not absolutely correct. It agrees well, however, with the high percentage ($4\frac{1}{3}$) of left-handed children when the entire school population is taken into account. I believe there is no escaping the conclusion that left-handedness is at least twice as frequent among colored as among white families. The less active repressive efforts counteracting the factor of imitation may probably be responsible for the high percentage among colored children. As explaining the above high ratio of left-handedness to right-handedness (29 to 25), I wish to emphazise the fact that among the 29 childships there are 7 cases of an only child, and this is left-handed (in 10 cases the entire childship was not given). This fact indicates either great infant mortality or a low birth rate. In fact, from what I have seen, I should say that both conditions more generally prevail; the second, contrary to the usual opinion, more especially.

It remains to explain briefly the method employed in collecting the facts regarding the pupils of the public school. The following questionaire was prepared and given to each teacher:

> Determine the number of left-handed children in the Charlottesville city schools, and the degree of left-handedness in each case; i.e., what do left-handed children do with left hand and what with right hand.

Obtain answers to the following questions:

1. Which foot is used in kicking?
2. On which side is hair parted?
3. Which eye is stronger?
4. Comparative degree of intellectual capacity.
5. Which hand is preferentially used for gestures?
6. Which of the parents is left-handed?
7. Who among grandparents is left-handed?
8. How many children in family? And how many are left-handed in any degree? Give sex of each.
9. Who among the brothers and sisters of the parents of left-handed individuals are left handed?
10. State additional matters of interest, and give total enrollment in school.

In the great majority of cases the left foot was used for kicking.

The returns regarding strength of eye showed an apparent equality respecting the number of right-eyed and left-eyed pupils. The simple nature of the tests employed, however, may render this result of doubtful value.

As regards the intellectual capacity of left-handed compared with right-handed pupils no significant difference could be deduced from the report.

I wish here to acknowledge my great indebtedness and to express sincere thanks to the teachers of the city schools and especially to the superintendent, Prof. J. G. Johnson, Ph.D., for the painstaking, thorough, and conscientious manner in which the investigations were conducted. Without this kindly coöperation the work would have been practically impossible.

INTERPRETATION AND CONCLUSION

The above detailed evidence is conclusive I believe, that left-handedness is hereditary. In what way or by what principle this inheritance acts remains obscure. From the 22 more complete pedigrees (of the 78 families studied), 6 childships (Nos. 2, 3, 9, 11, 12, and 24) can be selected of four or more individuals where the proportion of left-handed to right-handed individuals is approximately equal (*i.e.*, one less or one more than half in childships of more than four individuals). Tabulating these, the result shows an equal number of right-handed and left-handed individuals. The significance of this proportion lies in the fact that it need not necessarily have been even, *i.e.*, the more than half need not necessarily have counterbalanced the less than half of the childships. This ratio (not as significant as desirable because selected) suggests the Mendelian

ratio of the formula above, or the condition that obtains by crossing a heterozygote (*RL*) with a homozygote recessive (*LL*). The writer does not however delude himself—nor does he wish to leave the impression of attempting to mislead his readers in this matter—that left-handedness even appears (on the basis of the limited data presented) to follow Mendalian principles of inheritance. The sole step of prime importance he insists on at present is that the phenomenon of left-handedness is hereditary in some way.

The writer hopes that the inconclusiveness of this contribution on important points may be pardoned by reason of the preliminary character of the work; moreover, that the effort was justified because of the promise revealed, and the problems suggested in this field.

Superficially considered, it seems a far cry from the inheritance of coat-color to that of such a subtle characteristic as left-handedness. The gap here is perhaps only as wide as between this characteristic and such apparently still more subtle characteristics as virtue, justice, temperance, integrity, thrift, sagacity, etc.—characteristics of prime significance for the future trend of human history—and if the former gap can be bridged by hereditary formulæ, as seems possible, why not the latter? Once the principles which govern the transmission of these highly desirable human qualities are known, their "fixation" in continually increasing numbers of individuals seems a comparatively easy problem.

Facts regarding the conduct of the variation of left-handedness in heredity may reveal valuable information for the science of eugenics.

Again, if a characteristic like left-handedness rests upon an anatomical variation (a hypothesis well supported by various facts) perhaps many other characteristics have a similar basis and are amenable to experimental methods of research and simple methods of control. The study of left-handedness also finally shows (on Mendelian assumptions) the phenomenon of the "imperfection of dominance," as revealed in numerous cases of congenital and acquired ambidexterity. Moreover, the apparent imperfect dominance would here seem to be due proximately to a more or less complete structural and functional symmetry of the cerebral hemispheres.

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DISTRIBUTION OF IMPROVED SEED GRAIN IN KANSAS

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I do not think the presentation of a paper on this subject before this body of breeders and scientists needs any excuse or explanation. I observe, however, that much of the effort of this organization has been directed towards the propounding and demonstration of theories and facts related to the breeding and improvement of plants. This is necessary and valuable work, but the establishing of breeding laws and the production of improved and pedigreed seed or plants has little immediate value to agriculture, unless the improved plant or high-bred seed is propagated in large amount and distributed among the farmers for planting. The distribution of improved seed is just as important as the breeding, and this is a subject too often neglected by scientific breeders and by the experiment stations.

The writer's method of breeding crops aims to make the work count, not only scientifically and on paper, but toward producing the real thing, the improved seed, in quantities sufficient to distribute to the farmers, so that they may at once have the benefit secured from growing the better variety.

Some practical system must be adopted in every State by which high-bred or pedigreed seed may be grown and placed in the care of responsible farmers for further multiplication and distribution. The testing of varieties and the breeding of crops by the experiment station has little value unless the farmer secures the improved seed and grows it in large areas, to replace seed of average or inferior quality.

The method or methods of securing and distributing improved seed grain in Kansas may be briefly described as follows:

1. Many varieties of different kinds of standard crops are tested and compared at the State experiment stations, to prove their adaptation and productiveness, and the quality of their product.

2. The best producing varieties are improved and purified by careful hand selection in the field, and the seed is further improved by selection and grading.

3. Still further improvement and greater purity is secured by breeding the grain by the "ear-row" and "head-row" methods, by which pedigreed strains may be established.

4. The improved grain is grown in separate fields in larger areas to produce seed grain for distribution.

5. The seed grain tested by the experiment station is sold to the farmers, at their option or order, viz., the farmers voluntarily order and purchase the seed grain at the price fixed by the experiment station.

6. The seed grain which is offered for sale by the experiment station is advertised in different ways—through announcements in bulletins, by answering correspondence, by replies to inquiries published in farm papers and in local papers, and through the farmers' institutes, corn shows, and State farmers' meetings. During the last three years there has not been much need for advertising, since the demand for the "college-bred" seed grain has far exceeded the supply.

7. The improved seed grain has always been sold at a fair seed price, *at least double the market value of the grain.* The price varies somewhat, according to the improvement or breeding which the crop has received. Seed wheat has been sold at prices ranging from $1.40 to $2 per bushel. The selling price for seed corn has ranged from $1.50 to $5 per bushel, according to the breeding, variety, and grade of seed.

There has been very little complaint from purchasers regarding the price of seed grain. The better farmers are willing to pay a good price for good seed. In fact, many prefer that the experiment station should charge a high price for improved seed, because this allows them to grow the crops and continue the distribution of the seed at good prices, usually a little less than those charged by the experiment station.

The establishing of higher prices for well-bred seed grain than for scrub seed is placing the purebred seed business on the same plane as the purebred stock business, and there is just as good reason why a bushel of well-bred wheat which has been carefully and properly saved for seed should sell for double the market price as for a purebred calf or colt to sell for double or treble the value of a mixed breed or scrub.

8. Farmers who purchase seed from the experiment station are encouraged to keep the "college-bred" seed pure, grow it under favorable conditions, and save the crop again for seed, and thus become further distributors of the improved seed grain.

9. A record is kept by the experiment station of each sale of well-bred seed, including the name and address of the purchaser, the date of his order, and the value, grade, and amount of seed purchased.

The seed distribution work of the experiment station has continued now for six years. The larger part of the seed, however, has been

distributed during the last three seasons. More than 25,000 bushels of well-bred seed of standard farm crops have been sold and distributed by the experiment station, at Manhattan, and by the Ft. Hays branch experiment station, at Hays, including 15,000 bushels of seedwheat, 3,000 bushels of seed corn, 2,000 bushels of seed oats, barley, and emmer, 2,000 bushels of Kafir corn and broom corn, cane, and milo seed, and smaller quantities of flax, millet, cowpeas, and soy beans.

10. The experiment station gives some superintendence to the growing and saving of the crops for seed by farmers, by inspecting the fields when possible and by securing reports from each grower giving information regarding the variety, yield, purity, quality, and amount and price of seed grain which he will have for sale.

11. Published lists giving such data as named above have been prepared each fall and spring during the last three years, 1908, 1909, and 1910, and these lists are sent to those who inquire for seed grain. In this manner the experiment station has been able to assist in the continuing of the distribution of many thousands of bushels of "college-bred" seed wheat and seed corn.

The writer estimates that 25,000 bushels of Kharkof seed wheat were distributed by this means in 1909, and Prof. L. A. Fitz, who now has special charge of the inspection of wheat fields and the listing of wheat growers, reports the sale and distribution of 60,000 bushels in 1910. Seventy-two farmers reporting listed 30,000 bushels of "college-bred" seed wheat for sale in 1909. Growers were listed from forty counties in the State.

During the seed wheat campaign last summer 144 wheat fields were inspected by Professor Fitz and his assistants. Two thousand copies of list containing 162 names of farmers offering "college-bred" seed wheat for sale were distributed in answer to requests from inquirers. Each farmer on the seed-growers' list was requested to supply certain information regarding his crop and keep a record of sales. Fifty-four of the listed wheat growers reported as requested. Their total sales amounted to nearly 30,000 bushels. The quantities sold by individual growers ranged from 10 bushels to 3,200 bushels. The average yield per acre in 1910, secured by growers reporting, was 22 bushels. This was an average increase over other wheat of $5\frac{1}{2}$ bushels per acre, or $33\frac{1}{3}$ per cent.

Two million acres of winter wheat seeded in the fall of 1909, in Kansas, entirely winterkilled and were plowed up. The remaining 4,686,000 acres made an average yield of 12.8 bushels per acre.

Much of the wheat harvested had been severely damaged by winter-killing. The average yield per acre for the State in 1909 was 14.6 bushels. The average yield for the last ten years, 13.9 bushels.

Much well-bred seed corn has also been distributed by this method. Seventy growers reporting listed over 10,000 bushels for sale in the spring of 1910, and reports indicate that the supply did not equal the demand.

For the purpose of securing and giving information on the subject of crop improvement and seed distribution, the experiment station has published a number of bulletins, circulars, blank forms, lists of growers, etc., copies of which may be secured by those interested.

12. Another plan which is being developed proposes to distribute improved seed grain by means of the county demonstration farms, which are now being established in many counties in Kansas. The law passed in 1909 allows for the establishment of demonstration farms in connection with the county poor farm of each county at the option of the county commissioners and in coöperation with the agricultural college. Seventeen demonstration farms have already been organized. The plan is to plant only improved or "college-bred" seed on these farms, save the crop for seed, and sell the surplus seed grain to the farmers in the county who may wish to purchase it at a price somewhat in advance of the ordinary seed price.

Several of these farms have already been established and a few have raised a crop of purebred seed wheat which was sold for seed last fall. On the county farm in Barton County, Kansas, last year there was a field of 11 acres of Kharkof wheat that produced an average of 45 bushels per acre, and every bushel was sold for seed to the farmers of the county at $1.50 per bushel. From five or six demonstration farms in eastern Kansas last year the sales of well-bred seed corn aggregated over 1,200 bushels and sold at an average price of $1.50 per bushel. On these several farms the following crops have been grown for the production of seed to sell: Kharkof wheat, Kherson and Red Texas oats, and improved strains of Kafir corn and cane and several varieties of well-bred seed corn. No variety has been planted on any demonstration farm which did not have the approval of the professor of agronomy of the agricultural college.

This method promises to be a very successful means of growing and distributing improved seed grain which will be especially adapted to local climatic and soil conditions.

When the writer took charge of the agronomy work at the Kansas State Agricultural College in the fall of 1902, there was not a bushel

of well-bred seed grain of any kind on the experiment station farm. The work of variety testing and crop improvement by seed selection was begun in 1903. As soon as it was shown that certain varieties were superior, or as soon as pure seed of some of the better producing varieties could be produced, these varieties were grown on larger areas and the surplus seed was sold and distributed among the farmers of Kansas.

A small amount of seed grain was distributed in 1904 and 1905, being mainly seed wheat from seed which was tested for several years in the State, at the United States Government Coöperative Experiment Station, at McPherson. In 1906, a larger amount of good seed grain was distributed, including some well-bred seed corn. The breeding of corn by the "ear-row" method was begun in 1903 and 1904, and the breeding of wheat and other grains by the "head-row" method was begun in 1906 and 1907. The improved varieties produced by seed selection and breeding, especially of corn, Kafir corn, and cane, were propagated as rapidly as possible, and the amount of well-bred seed grain distributed has steadily increased each year.

During the interval of five or six years since this seed distribution work began, the agronomy department of the agricultural college[1] has distributed over 5,000 bushels of seed wheat, nearly 3,000 bushels of seed corn, more than 2,000 bushels of seed oats, barley, and emmer, nearly 2,000 bushels of cane, Kafir corn, milo maize, and broom corn seed, and smaller quantities of seed of other crops, such as flax, millet, cowpeas and soy beans. The total quantity of well-bred seed distributed amounts to more than 12,000 bushels.

Similar work has been carried on at the Ft. Hays branch experiment station. More than 10,000 bushels of improved seed wheat has been distributed by that station. Over 6,000 bushels of pure Kharkof seed wheat was distributed last fall, 1910. The Ft. Hays station has also sold and distributed several hundred bushels of good seed of corn, Kafir, and cane, and a thousand bushels or more of pure seed of oats, barley, and durum spring wheat, or in total an amount nearly equal to that distributed by the agronomy department.

This seed grain has been sold largely in small quantities as stated above; hence, the improved seed has been distributed widely to thousands of farmers in every part of the State and to a considerable number of farmers in other States. By the method described—

[1] The writer had charge of this department from December 1, 1902, to June 1, 1910, when he was transferred to Ft. Hays branch experiment station, as superintendent.

encouraging the farmers to save their crops for seed and sell the surplus seed—large quantities of "college-bred" seed, amounting to several thousand bushels of seed corn and many thousand bushels of seed wheat, having been distributed and planted.

The wheat area of Kansas averages about 7 million acres annually. The writer estimates that 2 million acres of Kharkof wheat—the variety most widely distributed by the experiment station—was planted in the State last fall, 1910. The comparative tests at the experiment station and the reports of many growers prove that under equal conditions, where hard red winter wheat is adapted, the Kharkof will yield from 25 to 30 per cent more grain per acre than ordinary scrub wheat, which is still planted on a large area. The Kansas wheat crop in 1910 was so severely injured by winterkilling in parts of the State that the acre yield or the whole State was reduced below the average, and the result of planting improved seed was not apparent. The possible increase in our yield of wheat in 1911, due to the distribution of better seed, may be estimated at not less than 6 million bushels.

In the distribution of improved seed corn an important agency has assisted which I have neglected to mention. This is the "boys' corn contests," work which is carried on under the college extension department. Thousands of boys have secured improved seed corn by taking part in this contest, and the variety of corn by proving its superior quality has usually remained on the farm, the farmers often purchasing more seed of the same variety, in order to plant larger fields.

The instruction at the agricultural college in the regular courses and through the boys' and men's short courses, through the farmers' institutes, experiment station bulletins, and the agricultural press, has also given efficient aid in the progress of seed improvement.

The average acre yield of corn in Kansas for the last ten years has been about 21 bushels. The corn crop of 1910 was severely injured in parts of the State by very hot weather and drouth in July and by chinch bugs, and the acre yield was below the average, only 19 bushels. In 1909, the acre yield was 20 bushels, but 200 growers reported an average yield from "college-bred" seed of 36 bushels per acre.

The writer estimates that from one-third to one-half the total area of the State, or about 3 million acres, will be planted with well-bred seed corn next spring, and it is not extravagant to estimate an average increase in yield, due to the better seed, of 5 bushels per acre on this area, or a possible increase in the Kansas corn crop in 1911 of 15

million bushels. This is not speculation, but a careful estimate deduced from facts.

Improved seed distribution and the education on crop improvement which has accompanied it have produced another very important result, viz., the farmers have become awakened not only to the necessity of improving the crops, but to the necessity of improving the soil fertility and practicing better farming methods. The distribution of improved seed grain in Kansas, therefore, marks the beginning of a new agricultural area which will be noted for high crop yields and great agricultural prosperity.

Kansas has already made a national reputation through her improved seed distribution; in fact, this reputation is world-wide. It actually appears that the work done in Kansas along this line is noted and talked about and written about more outside of the State than within the State. Inquiries and orders for seed wheat and seed corn have come to the experiment station from all over the United States and from several foreign countries, including Australia, South Africa, and several of the countries of Europe and South America. A year ago the Kansas Agricultural Experiment Station shipped 50 bushels of improved Turkey Red wheat to the Transvaal government of South Africa. A bushel of seed of each of ten varieties of Kansas-grown corn was shipped to the government experiment station, at Brisband, Queensland, Australia, in the spring of 1910. Exchanges of seed wheat and other seed grain have been made with several experiment stations in Russia. In 1908 the experiment station in southern Alberta, Canada, ordered 60 bushels of our Kharkof and improved Turkey Red wheat, which was sent with charges of $2 per bushel, rather expensive seed wheat, but one of the best investments that Alberta ever made. This well-bred Kansas wheat yielded over 50 bushels per acre, or 9 bushels more than the best Alberta red varieties in 1909, on the experiment station farm at Lethbridge.

I am informed that thousands of bushels of wheat from this seed have been distributed and planted by Alberta farmers.

The writer has recently been invited to deliver addresses on this subject before the National Corn Show, and American Breeders Association, and at the meeting of the Council of American Grain Exchanges. It is evident that this work in Kansas has created great interest and is attracting much attention in other States and other countries.

The improvement of crops by breeding and selection is primarily the work of the experiment station, and the experiment station should

be the source and first distributor of well-bred seed. But the amount of seed supplied by the experiment station is necessarily small, and the farmers who secure the better seed must grow it carefully, keep it pure, and continue the distribution, in order that great and rapid benefit may result from the work of the experiment station. The permanent improvement of crops rests with the farmers who shall continue the growing and distribution of improved seed.

AN EXPERIMENT IN FUR-SEAL CONSERVATION

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For a quarter of a century the "fur-seal question" has been one of the most serious problems with which the Department of State at Washington has had to deal. So long as the killing of seals was confined to the land on which they haul out during the breeding season there was no difficulty; but when certain people in British Columbia discovered that fur-seals could be killed in the open sea in sufficient numbers to make the business very profitable, then trouble began. This was in the early eighties. Pelagic sealing, as killing seals in the open sea is called, developed rapidly and it was only a few years until the very existence of the fur-seal herd as a commercial entity was seriously threatened.

The killing of seals on the islands can be, and always has been, carefully regulated by the Government. In the first place, it must be understood that the fur-seal is a polygamous animal, like sheep, cattle, or domestic poultry. While the sexes are born in approximately equal numbers, one male to every thirty to fifty females is adequate for breeding purposes. The surplus twenty-nine to forty-nine males are not needed and can be killed without in the least endangering the existence of the herd. There is no more reason for refraining from killing each year the surplus male seals than there would be in a stockman saving all the rams or roosters on the ranch. It has therefore been the policy of the Government never to kill any female seal but to kill each year the surplus young male or bachelor seals after reserving a sufficient number for breeding purposes.

In this way the Government was able to conserve the herd at high efficiency and at the same time permit the killing of about 100,000 young male seals each year, yielding an annual revenue to the Govern-

ment of about $317,500. That number now would yield a revenue of more than a million dollars annually.

But pelagic sealing is different. The pelagic seal hunter cannot distinguish between male and female seals or seals of different ages in the water; he would make no distinction if he could. Every and any fur-seal he sees is proper spoil for him; none is allowed to escape, whatever the sex or age. And experience and the records show that vastly the greater part of the pelagic catch each year consists of females. Every female seal killed in the open sea means not only her death and that of her unborn pup but also that of the pup which she leaves on the rookery when she goes out in the sea to feed. Every time a female seal is killed in the open sea a fur-seal pup is left to starve. Since pelagic sealing began some thirty years ago hundreds of thousands of pups have starved miserably on St. Paul and St. George.

The possibility of saving these motherless pups from starvation has often been considered, and several attempts have been made to induce them to take artificial food. All such attempts failed utterly. Every pup experimented with refused absolutely to take any kind of food, although various and ingenious devises were employed to induce or force them to do so. Similar attempts with older or adult seals also failed. They chafed under restraint or confinement, refused any and all kinds of food, and finally died of starvation.

Apocryphal tales may be heard on the Pribilof Islands of fur-seals having been tamed and living thereafter in the houses of the natives of the islands. In the early seventies the Alaska Commercial Company brought down from the islands two immature live fur-seals, their exact age not definitely known, and placed them in Woodward's Gardens at San Francisco, but they died of starvation after several months' incarceration, having eaten nothing during the interval. This experiment at Woodward's Gardens, and all other similar attempts, fixed the belief that fur-seals in captivity could not be induced to take food.

Recently, however, the experiment was again tried and with complete success. The effort had its inception in the desire of Dr. Fox, surgeon of the revenue cutter *Bear*, to ascertain whether the fur-seals are infected with ectoparasites. For this purpose a starving pup, whose mother had been killed by the pelagic pirates while feeding at sea, was given to the *Bear's* surgeon. After having been examined by Dr. Fox the half-starved little animal was turned over to Mr. Judson Thurber, the *Bear's* boatswain, who desired to attempt feeding the pup by artificial means. He was so far successful that he induced

it to eat dried fish from his hand, and kept it for three weeks, when it died in convulsions. Desiring to have the experiment carried further, two well-conditioned fur-seal pups, a male and a female, were obtained on Gorbatch rookery, St. Paul Island, and furnished to Boatswain Thurber on October 9, 1909. Mr. Thurber began his experiments by forcing condensed milk down the throat. On October 19 the female began eating solid food. Each of the pups experienced some difficulty in swallowing solid food, due, the boatswain thought, to the fact that the tongue was tied down too firmly by the membrane or frenum which binds it to the floor of the mouth. He was led to this opinion by observing that the female pup ate more easily after breaking the membrane loose. He then tore loose the frenum of the male's tongue, with the result that he, too, began to take food more freely.

In conducting the experiment Mr. Thurber showed no little skill and infinite patience. At first he would hold their mouths open, pour into them diluted evaporated cream mixed with small bits of fish, and then, holding the seal up by the head, shake the food down. In this way some of the food reached their stomachs and the seals got the taste of food. Then he would tie a small piece of fresh fish on the end of a string and tease the seal by dangling it in front of its nose until the seal snapped at it, when it would be poked down the throat and the string cut.

By the first week in November both seals were eating greedily. When the *Bear* arrived at San Diego late in the fall, and the commanding officer, Capt. E. P. Bertholf, reported to Washington that the *Bear* had two fur-seal pups on board and in good condition, steps were at once taken by the Hon. George M. Bowers, Commissioner of Fisheries, to have them brought to Washington. All necessary details were soon arranged and Boatswain Thurber arrived in Washington January 11, 1910, with his precious pets. They were hurried from the express car to the Bureau of Fisheries, where they were received with great interest; for no one at Washington except the few fortunate ones who had visited the Pribilof Islands had ever seen a live fur-seal. They were at once placed in the large pool at the bureau after being photographed, measured and weighed. This pool contained fresh water, and the effect upon the seals was awaited with interest. If they showed any distress it was arranged to supply them with salt water. But the fresh water did not appear to worry them in the least, and they have been kept in it continuously to the present time.

Although somewhat restless at first they soon quieted down and appeared perfectly at home. They are fed regularly twice a day on

fresh fish, which they take eagerly, each eating from 5 to 8 pounds daily. When they were first weighed (January 20, 1910), the male weighed 28 pounds and the female 19½. Since then they have been weighed regularly on the twentieth of each month. On October 20 they weighed 46½ and 34½ pounds, respectively. This is a gain of 66 per cent for the male and 77 per cent for the female in nine months. Whether this is a normal growth no one really knows, for never before were any accurate observations made to determine just how much a fur-seal six months or fifteen months old ought to weigh. But those who are familiar with seal life on the Pribilof Islands say that these two pups appear fully as large and fine in every way as those of the same age on the rookeries.

Not only have these two pups been kept in fresh water, but the water in the summer was much warmer than any Alaska fur-seal was ever before called on to endure. In July the temperature of the water ran as high as 83° F., and the average for that month was 80°. But this high temperature apparently produced no evil results; indeed, the seals during July were not only as playful and active as usual, but they actually ate more during that month than in any other.

They have proved the most interesting pets that have ever been kept in the aquarium at the Bureau of Fisheries. They are the most expert swimmers imaginable. Their favorite pastime is to swim rapidly around the large pool in which they are kept, sometimes as rapidly as the most rapidly flying bird, often jumping like porpoises and splashing water on unsuspecting visitors. They circle about the pool, always turning to the right with the hands of the clock. Immediately after feeding they begin scratching and rubbing themselves, a sort of massage which doubtless aids digestion.

These fur-seal pups have now been kept in captivity more than a year. They have been kept in fresh water more than nine months. They are now sixteen months old and appear to be in excellent condition. The experiment has so far proved eminently satisfactory. It has demonstrated a number of very important facts. In the first place it has shown that fur-seal pups can be taught to take food when offered them by man. It also shows that they can be kept in captivity and carried long distances on vessels or railroad trains without any special difficulty, that they will live and thrive in fresh water, that a salt-water environment is not essential, and that they can live without any apparent discomfort in water of a much higher temperature than that of their natural habitat.

The success of this experiment also suggests a number of interesting possibilities. May it not be possible to save the hundreds or thousands of pups whose mothers are killed by the pelagic sea pirates every year? To do this it would be necessary to feed the pups only until the herd leaves the islands late in the fall. After they have once been taught to take solid food it would seem that they might be permitted to leave the islands with the rest of the pups and that their chances of survival in the sea would be quite as good as any.

The supplying of fur-seals to public aquariums and zoölogical parks is another possibility which seems entirely practicable. The possibility of establishing a colony of fur-seals in some fresh-water lake is also suggested. The essential features would seem to be a lake with an adequate supply of fish, which does not freeze over entirely in winter, and in which the seals would be fully protected.

But most interesting and important of all is the possibility of establishing colonies of fur-seals on our North Atlantic Coast. If the Canadian government could establish a fur-seal colony or rookery somewhere on her east coast, the pelagic sealing question would speedily be solved; for it would seem that Great Britain would at once join the United States and the other maritime nations in an international game law or agreement by which the high seas beyond the three-mile zone would become a place of refuge for all marine mammals such as fur-seals, sea-lions, walruses and whales. This would not only stop pelagic sealing, but it would be the most effective step ever taken for the preservation of these rapidly disappearing animals. It is true that the difficulties in the way of establishing the fur-seal in the Atlantic are very great, but I think they can be met.

NOTE—Since this article was written the experiment has been carried still further. The two seals are still alive and apparently in excellent condition at the present date,—September 9, 1911. On August 20, 1911, they weighed 63 and 41.5 pounds respectively.

[Presented by Committee on Fur Bearing Animals.]

EDITORIALS

SIZE OF FARMS AND FARM FAMILIES

The New York Agricultural College at Cornell has recently issued a bulletin based on an agricultural survey of four townships in the New York county of Tomkins, in which the college is located. This report, by Prof. G. F. Warren and others, shows that in order to assure a reasonable family income the family farm should be rather large. The deductions from the statistics collected seem to indicate that the best size is somewhere between 160 acres and 200 acres for Tomkins County, where the average value of the land is low.

Merely from the standpoint of economic production as the result of a sufficient division of labor, profitable employment of labor, and the utilization of labor-saving machinery, a farm large enough to employ two or three workers was found to be the most profitable.

On farms up to about 100 acres in area the cost of production per acre and per worker is relatively too great. The crop yields on these smaller farms are not sufficiently greater to overcome a larger cost per acre of man labor, horse labor, machinery, and incidental expenses. A farm owner, to make an income beyond his own labor wage, must have acreage enough to use two, three and four-horse teams, and the machinery adapted to those teams, rather than only one or two horses. The larger farm makes it possible for the farmer to use the labor of his sons, or of one or more hired men, so as to make some profit beyond the market value of their labor.

The fact that a relatively small part of the farmers can make good incomes by intensively cultivating a small fruit or vegetable farm has led many people to believe that our family farms are generally too large to serve best the interests either of the farmers or of those who purchase the farmers' products. It must be remembered that the bulk of the American farm products is composed of grains and live stock, and that these are and must be produced in a broad way under conditions of general farming.

On the other hand, the assumption that the results obtained in the course of this agricultural survey indicate that our farming must eventually go the way of the businesses of transportation, of manufacture, and even of merchandising, and be organized under large companies, is not justified. In farming, where the home and the business are a unit, there is another most important interest at

stake, aside from profits per acre and per worker, or the abundance and cheapness of products supplied to consumers in our cities.

The larger farm product is the farm people. The plan of one farm and three hired men is good for the farmer and his family, but not good for the average of the four families; and if we extend this centralization so as to have one farmer and nineteen hired men, the farm profits are centered in a still smaller number of farmers. Thus a larger school district, such as a consolidated rural school district of 20, 30, or 40 square miles, might have ten farm homes and 190 homes of hired men. Two hundred families thus situated would not make so strong a community as under the present plan of 100 farmers on family farms assisted by their fifty sons and fifty hired men, making two men to the farm. It should be remembered that most of the hired men under family farm conditions are farmers' sons working their way up to become landowners.

This plan gives two men per farm. It avoids on the one hand the too small farm plan which France brought about by enforced legal division of farm estates, and on the other hand the too large estate which in England is made possible by the law permitting primogeniture and the entailment of estates, and keeping the entire large estate intact for the eldest son.

The larger public policy will be best served when the eugenics side of country life is fully appreciated. If the two-man farm plan will produce the greatest number of good citizens, will conduce to the production of the strongest country people, and will result in the largest measure of happiness to the sum of the people in the open country, means should be discovered not merely to preserve but to highly develop country life under that plan.

This bulletin from Cornell, however, adds to the conviction that farming must follow all other lines of business and be organized. There must be either radical centralization of the ownership of land or the less radical but fully as effective individual ownership with fullest coöperation to attend to the general business of the farm. The interests of the race strongly favor the latter plan, provided there be really effective coöperative organization. Fortunately plans are being formulated in thousands of communities which promise solutions, and which may lead to a remarkable development of our already unparalleled country life.

Colleges of agriculture; agricultural technological high schools; local schools made over in the interests of country life, departmental and college extension departments, and publishers of literature relat-

ing to farming and farm home making are developing adequate means to take to all farm people the rapidly accumulating stores of knowledge relating to the farm and the farm home and are working out a wonderfully productive scientific technique of farming and country living.

What promises to be the most important single element in all of this development is the consolidated rural school, serving a large community or district. Six or eight one-room rural school districts, covering a scope of 20 to 36 square miles, are consolidated into one school large enough to have institutional organization. Fifteen of these schools in the average county bring vocational as well as general education within driving distance of all farm youth. This institution unifies the education for country life and it also recenters nearly all other country life interests. It promises to lead a technologically educated people into general economic, social and educational coöperation.

In this community attention will come to be paid to the values of good heredity, and the community will doubtless come to look upon each farm home as an institution in which the public, the State, and the race is interested as the source of strong people.

The two-man farm of 160 acres is in danger, and with it America's plan of producing the most just and beautiful country life in the world. The danger is that publicists, educators, and even the farmers themselves look primarily at the business side of farming.

Our investigators into farm management need to look very specifically at the economic side of farm organization, but they need also as clearly to investigate the social, racial and eugenic interests of life in the open country.

THE FIELD OF EUGENICS

Man will one day know himself better and will use more care to cultivate assiduously the consciousness that he is a higher being with most wonderful possibilities. Eugenics will ere long drive home to the human race the fact that its worst blood should be reproduced but slowly, if at all, and that it is a sacred duty of the best blood to multiply itself and people the earth.

In a newly colonized country, its forming race is hybridized in the most complex manner; but no matter how complicated, it is possible to establish the racial breeding values of each strain and family; and the probable value of each individual as a progenitor of generations of children can be at least roughly determined.

Society and even the church can then place a social pressure upon, and deter from reproduction, those likely to produce weak, diseased, or criminal offspring, and the state can even restrict child bearing on the part of those most deficient. Thus the major part of the weak fibers can be eliminated from the network of human descent.

But even more important is the fact that efficient blood can be encouraged by many agencies at the command of society to produce such numbers of children as they can well support and train. High public regard of unusually efficient families, probably more than anything else, will be instrumental in stimulating pride of family among individuals, and in encouraging them to perpetuate their superior qualities in larger families of children.

Society is now rather assisting families of weaker heredity to multiply, through various forms of otherwise most beneficent charities. How to lessen the effects of thus breeding the race downward, and how to favor the production of progeny whose blood improves the network of descent of the race, are still difficult problems. That the human race will highly develop its plants, its domestic animals, and its household pets, and permanently neglect itself does not seem plausible.

The methods at the command of eugenics are narrower than those employed in plant or animal breeding. In case of the apple we can produce ten thousand seedling trees, test each tree as to quantity and quality of fruit, and discard all but the one best, and then by grafting, budding, or other processes we can soon so multiply the one plant that it will fill all the orchards of the region to which it is adapted. In breeding cattle, swine, or poultry, individuals which are inferior or are susceptible to disease can be discarded. In cereals, live stock, or fruit, two or more strains, each possessing desirable characters, can be hybridized, thus engrafting upon the new stock the good qualities of both parents. And even in hybrid plants the selection of progeny can be so restrictive that only that one in hundreds or in thousands, or in tens of thousands, which comes nearest the desired type, need be selected.

In the human family there can be no such sweeping discarding of the unfit. But the superlative importance to the species of multiplying the good blood and thus building up better race stocks makes even a narrow range of possible improvements a matter of vital concern. Family genealogies are needed which, not as the present comparatively worthless ones, merely record names and relationships, but which make a note of certain characteristics of each individual.

When racial, family, and individual values shall have become matters of pedigree record, and eugenics shall have passed the stage of ignorance and prudishness, the race will more rapidly slough off its weak branches, while the more virile and useful stocks will build up the tree of life. From generation to generation, eugenics, improved physical environment, education, religion, and the inherent impulse in the human soul to aspire after better things will relegate to inactivity the weaker and baser characters.

The improvement through heredity may at first be painfully slow. The improvement from education and from an ever-growing altruism will for some time be more rapid. But the race will experience its greatest improvement and attain its greatest ultimate physical and intellectual development through eugenics, because heredity is basal, and every point gained in heredity serves as a better basis upon which to build all other improving processes.

WORLD'S FOOD REQUIREMENTS MET BY BREEDING BETTER TYPES

No one who studies world economics can doubt that a permanent world competition for food at high prices has begun. Increase in the world's population and increase in the purchasing power per capita of all thrifty peoples will not only sustain prices for farm products, but will require rapid and large increases in the total product. In two or three generations we shall need to feed 180,000,000 people in the United States where we now feed 90,000,000. Since the present population consumes $7,500,000,000 worth of farm products annually, the requirements then will be for products worth $15,000,000,000.

Assume that the 10,000,000 farmers in the entire country sixty years hence will annually apply fertilizers worth one dollar per acre to 500,000,000 acres, at a cost of $500,000,000, and that the result would be $1,000,000,000 worth of added farm products, then the profit in this case would be $500,000,000, or 100 per cent.

Assume also that the federal and state governments, through their departments of agriculture and experiment stations, and the farmers and breeders of the country shall have expended in creative plant and animal breeding two dollars per farm, or $20,000,000. If this should increase the product one dollar per acre on one hundred acres on each of 10,000,000 farms, it would amount to $1,000,000,000, with a new profit of $980,000,000, or 4,900 per cent.

Further, we may roughly estimate that we shall during that time so add to our cultivated area as to increase our annual product by $2,000,000,000. It is fair to estimate also that by better crop rotation schemes, better tillage methods, and better methods of managing our live stock we can add yet another $2,000,000,000. The total addition thus provided would be $6,000,000,000—still one and a half billions worth of product short of the additional $7,500,000,000 needed.

It is entirely possible that the farmer and breeder under scientific direction, by spending somewhat more than $20,000,000 for creative breeding might produce the other one and one half billions worth of product needed. It is, indeed, probable that 25 per cent, instead of only 10 per cent, might be added to the yield of farm products by breeding and applying this to the increased acreage under the improved conditions assumed. Thus, approximately $2,500,000,000 of additional products annually would be possible through improvements in heredity.

In other words, it does not seem improbable that when our product is worth $15,000,000,000 fully $2,500,000,000 worth of the added product may be due to plant and animal forms producing an average of 25 per cent more than those now in use. Because of the relatively small outlay it requires, breeding is especially effective not only in increasing the quantity of agricultural products but also in reducing the cost of production. Let us give the heredity of the mutating plant and animal an important place as one of the world's great forces beside the fertility of the soil and beside the power which we utilize from water, coal, wood, oil and wind.

PRESERVE THE RED MAN'S HEREDITY

A movement has been inaugurated under the auspices of American Indians of pure and mixed breeding to foster and preserve the remnants of the Indian race. This effort has much in it which is to be highly commended. It will engender racial pride, will foster individual ambition, and will lead to tribal and family emulation. Eugenists will see in this movement a plan for preserving certain characteristics of this race, that they may not be lost from our sources of good blood. This new organization can help to preserve a race of purebred Indians, as the Arabian Horse Association in America is collecting and preserving pure blood of that class of horses. And as the Arab horses have served most effectively as the whole or partial

basis of some of our most useful families and breeds of horses, such as the saddle horse and the Morgan horse, so the blood of the Indian may perhaps be used as part of the basis of virile families of men.

No one need feel offended at this illustration from the domain of live stock. In fact, no small part of the plans which will be used in eugenic records designed either to preserve the heredity of races of men or to aid in their genetic improvement is being wrought out in the record systems of plant and animal breeding. And we have further illustrations in the animal world of the need of preserving the aboriginal races and species. A most notable example is the American bison or buffalo. A few men have saved it from extinction, and there is much promise that breeds of cattalo, made by hybridizing the buffalo and cattle, may have a large field of usefulness. At present small herds of these hybrid cattaloes indicate that breeds combining beef and fur production may be developed for regions requiring great endurance of cold winters, as in our northern mountain regions and in Alaska. The demonstration seems complete that robes finer, more uniform throughout, and more valuable than the buffalo robes of pioneer times can be produced by the scientific creation of breeds of hybrid cattaloes.

In some of the tribes of the American Indians are characteristics which may have uses in the future American type. The pigment in the skin may enable the crossbred between the pale face and the red man to thrive better in the hot regions of our own country or in the tropics. His endurance gained in the chase may help in making up the future race of men suited to many of the strenuous tasks which future civilization will, more even than now, impose upon both men and women. A strain of his stoicism and ability to live far away from his fellows may peculiarly fit him for the work of the forest guard in our great public forest reservations.

As a pure race, or perchance in mixture with our mountaineer whites, he may become our future mountain inhabitant, adapted at once to the rugged life of the isolated mountain home and to the service of forest workers in our great areas of forests under scientific public or private management. He may be peculiarly adapted to life on the great semiarid plains, where science has begun to guide the production of breeds of live stock for the production of meat, wool, and horses under conditions existing in the great short-grass country.

But why restrict him? Either in his purity of blood or in mixed races the American Indian may take up very many functions of life. The Indian needs only to see his racial problem, to study his genetic

destiny in the light of modern science, to find the niches, large or small, into which he may fit, and then redirect his energies to meet the new problems before him.

In numerous regions the amalgamation of the Indian and white races has so far developed that much of the psychological repugnance to the mixture of racial blood has been broken down. A study of the vigor, ability, and general character of these people of mixed blood of the third and later generation hybrids should be made by trained eugenists. Those characters which act definitely as Mendelian units should be known; also, those recombinations of unit characters which make for weakness, and those which give strength and both individual and genetic efficiency. Those persons who have begun the organization to preserve and build up the remnant of our ancient Indian blood may have in mind only education, political rights, and other environmental conditions. But the eugenic side of the movement is worthy of equal consideration.

A system of number names for which the Indian office could supply very much material would place this race in a position of advantage as compared with other races. By recording the individual value both in a single numerical statement and in unit character detail there would soon be records from which the genetic value of individuals and families may be deduced. Many of the methods of tabulating, averaging, and otherwise determining the genetic values of the respective individuals and families have already been practically wrought out in the science of breeding plants and animals.

Even a larger vision for the Indians to realize is that ere long all races shall have been brought under the scrutiny of genetic science. Then the Indian character as a whole and each racial unit character will be in competition under methods more or less aided by statistical records of performance with the characters of other races. It is a good guess that the Indian blood will not be near the foot of racial values and that families both of purebred Indians and of those mixed with white and other blood will find permanent places under a system of genetic records which will discredit all the weakest families if not the weakest races.

NEWS AND NOTES

REPORT ON CONFERENCE OF RESEARCH COMMITTEES OF THE EUGENICS SECTION

On May 2 and 3 a conference of the research committees of the Eugenics Section of the American Breeders Association was held at the Monson State Hospital, Palmer, Mass., under the presidency of Dr. W. N. Bullard, chairman of the Committee on Inheritance in Epilepsy. About twenty persons were in attendance, including the following members of the committees of the Eugenics Section: H. H. Goddard, E. E. Southard, F. A. Woods, Everett Flood, W. M. Carmalt. After introductory remarks by the presiding officer, brief statements were made by Dr. Carmalt, of New Haven, who stated that the law in Connecticut relating to sterilization had not yet been put in practice in a single case in that State. Dr. Ross, who has just been appointed superintendent of a new institution for epileptics in Mansfield, Conn., spoke briefly of the plans of that institution. Mr. H. H. Laughlin, superintendent of the Eugenics Record Office, moved the appointment of a committee to study the result of the experiment in sterilization made by various States. The chairman named as members of this committee Dr. Mitchell, superintendent of the Danver State Hospital, chairman, Mr. Laughlin, secretary, and Messrs. W. M. Carmalt, Bleecker Van Wagenen, and Everett Flood. Dr. Rosanoff, of Kings Park State Hospital, representing Miss Orr and himself, read a paper on "Further Studies on Inheritance in Insanity," confirming and extending the results of the paper by Miss Cannon and Dr. Rosanoff, recently published in the *Journal of Nervous and Mental Diseases*, showing that idiopathic forms follow Mendel's law.

Dr. Flood summarized the recent report of the commission appointed by the governor of Massachusetts to investigate the question of the increase of criminals, mental defectives and degenerates. The report had to be drawn up in a short time and the commission had small funds for its assistance. They reached a general conclusion that there is no evidence of an increase in the number of these defective classes in Massachusetts. They make a series of recommendations. Dr. E. E. Southard read the report of the Committee on Heredity in Insanity, of which Dr. Adolf Meyer is chairman. Dr. C. B. Davenport presented a paper on the relation between geographical isolation and consanguineous marriage, calling attention to the fact

that many islands off the New England coast showed much intermarriage of relatives and an unusually large proportion of cases of recessive characteristics in the population. Similarly, the valleys in mountainous or hilly countries and other communities isolated by their distance from railways and means of communication from the outer world are regions of consanguineous marriage. Dr. A. H. Estabrook, field worker of the Eugenics Record Office, gave an account of the degeneracy in a valley in eastern New York State. Here over two-thirds of the population of over 600 persons are mentally defective. There is a large proportion of consanguineous marriages. Dr. David F. Weeks, superintendent of New Jersey State Institution for Epileptics, reported on the methods that are being used to standardize methods of charting human pedigrees. These are set forth in Bulletin No. 2 of the Eugenics Record Office. This was discussed by Dr. H. H. Goddard, Mr. E. R. Johnstone, superintendent of the Vineland Training School, and others. Mr. H. H. Laughlin, superintendent of the Eugenics Record Office, gave a report on its work that is published elsewhere in this *Magazine*. Dr. C. G. McGaffin, pathologist, Taunton State Hospital, Taunton, Mass., presented three pedigree charts:

(a) The C. family: Four generations had been traced with a fair degree of accuracy and the living members of three generations had been interviewed. The first generation showed two cases of maniac-depressive insanity; the second, five cases of maniac-depressive, one of paranoia, and one of imbecility; the third, no active mental symptoms, but there was a prostitute, a vagrant, and one with a criminal record among its members; the fourth consists of children who up to the present have shown no mental symptoms, although two are considered weak-minded.

(b) The W. family: This family shows cases of Huntingdon's chorea in five generations, also some insane members.

(c) The H. family: A chart showing over 1,000 individuals with insanity in six generations. This chart was worked out entirely from the genealogical record of this family, a volume unique in its careful tabulation of biologic record.

Miss Florence Danielson, a field worker of the Eugenics Record Office assigned to the Monson State Hospital, gave an account of one of the families that she has studied most extensively, showing a high incidence of feeble-mindedness, alcoholism, and sex immorality in certain rural communities of southwestern and western Massachusetts. Dr. F. A. Woods read a paper on separating heredity from environ-

ment, published in a later *Magazine*. Mr. L. B. Alford, research officer and pathologist of the Monson State Hospital, spoke on inheritance in epilepsy after the Brown-Sequard method and demonstrated with guinea pigs.—C. B. DAVENPORT, *Secretary*.

THE HEURTIN FAMILY OF VERTOU

As an example of a defective germ plasm perpetuating itself persistently and with disastrous results the Heurtin family of Vertou,

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THREE OF THE HEURTIN FAMILY.

Stanislas congenitally deaf and nearly blind. Marie and Martha congenitally blind-deaf.

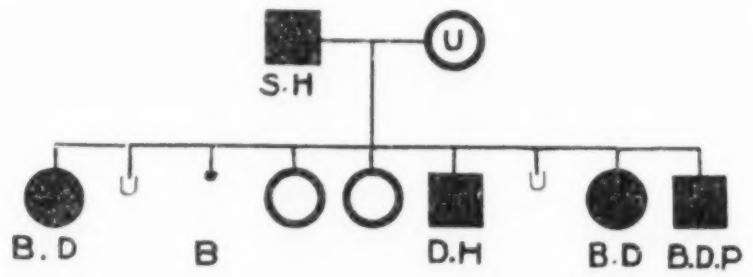
France, furnishes instructive material for the eugenist. A Breton tun maker, Stanislas Aristide Heurtin, in 1884 contracted marriage with his second cousin four years his junior. He is a sufferer from a spinal (marrow) disease and also from hemeralopia which is described as an abnormal condition of the eyes in which the sense of vision is impaired by artificial light (the reverse may also be the case, when it is day-blindness). Nine children resulted from this marriage, as follows:

1. Marie, born April 13, 1885; born blind-deaf.
2. Lucien, born February 8, 1887; died at the age of 21 days.
3. Eugenie, born December 11, 1887; born blind; died August 5, 1899.
4. Elisa, born December 24, 1891; in possession of all senses, normal.
5. Adelaide, born July 29, 1894; in possession of all senses, normal.
6. Stanislas, born December 21, 1896; born deaf and "hemeralope."
7. Germaine, born January 3, 1899; died March 12, 1902.
8. Marthe, born July 23, 1902; born blind-deaf.
9. Germaine Andre, born November 22, 1906; born blind-deaf and paralyzed in the limbs; died January 20, 1908.

Thus, summarizing, of nine children only two were normal and capable of enjoying all faculties, three were born blind-deaf, one deaf and "hemeralope," one blind, and four died young.

The close blood relationship of the parents may perhaps have been a partial cause of the infirmity of their progeny, but the greater probability is that the father's infirmities were responsible.

The heredity of the family is shown strikingly in the chart below.



HEREDITY OF THE HEURTIN FAMILY.

U Defect if any, not ascertainable.
S Spinal disease.
H Hemeralopia.
B Blind.
D Deaf.
P Paralyzed (in limbs).

The amount of physical defectiveness carried in the blood of this family is appalling. But there is no doubt of the correctness of the data, which are vouched for by M. A. Constantin, director of the Institution de la Persagotière at Nantes, France, who has favored the Volta Bureau, Washington, with the statement. Mr. F. K. Noyes, editor of the *Volta Review*, kindly loaned the copyrighted photograph shown above.

IMPORTANCE OF RAISING THE SECOND GENERATION OF CROSSES

This *Magazine* is read by some who can not find time to keep abreast of the theoretical side of the experimental work in breeding which has developed so rapidly of late. It may therefore be of use to notice the importance of getting the second generation from a cross. The breeder should not reject the results of a cross when the individuals of the first generation do not show anything which he thinks worth preserving. As Bateson states in his excellent account of breeding work (Mendel's Principles of Heredity, 1909), some amount of money has been lost through this procedure. It is difficult for most people to refrain from judging an animal or plant merely by its exterior. But the breeder at least must judge by performance and not by looks. He who rejects a crossbred plant or animal because its outward appearance does not satisfy him is throwing away a purse because it looks shabby, without opening it to see what money it may contain.

A good example of this has come under my notice. The velvet bean, which is an important forage crop in Florida, and bears short velvety pods, was crossed with a new and promising bean from the Philippines, the Lyon bean, which has long pods covered with down. All the plants grown from the crossed seed bore long pods clothed with fine hairs which got loose and penetrated the skin so as to cause irritation. In the words of the gardener, they "were covered with hot fuzz that nearly drove one crazy." If this cross had been raised during the last century, it is probable that all the stinging plants would have been burnt. But the knowledge already gained by experiment led to the saving and hulling of these pods. Their seeds grew into vines that bore pods, on some plants all stinging, on others all downy, on others all velvety, and on others nearly smooth. Differences as to early or late ripening, amounts of healthy pods, proportions of scattered seeds, long or short pods, sizes of seeds, colors of seeds, sizes of bunches, numbers of seeds in pods, etc., are visible, and enable selections of forage plants to be made from the progeny of those seemingly useless stinging plants of the first generation.—JOHN BELLING, *Gainesville, Fla.*

PROGRESS REPORT FROM GENETICS CONFERENCE TO BE HELD IN PARIS

The organisation committee of the fourth International Conference of Genetics assembled on June 14 under the presidency of Dr. Viger. Mons. Philippe de Vilmorin, secretary of the committee, told the assembled members what had been done to prepare for the conference. He had received 130 adherents of which three are honorary members. The sum received in subscriptions up to that date amounted to 2300 francs. The rest was expected to be received in the course of July. Not counting the names of the principal French biologists who are members of the committee, the following foreigners have subscribed: Baur, Giesenhagen, Goldschmidt Pfitzer, Poll, etc. (Germany); Agar, Bateson, Darbishire, Gregory, Miss Durham, Hartog, Laxton, Lynch, Nettleship, Paton, Punnett, Miss Saunders, Staples-Browne Sutton, Miss Wheldale, etc. (England); Bradley (Australia); Fruwirth, Strakosch, Tschermak, etc. (Austria); W. and C. Saunders, (Canada); Johannsen (Denmark); Balls (Egypt); Davenport, Hays, Howard, Swingle, Tower, etc. (United States); Hagedoorn, Houwink, Lotsy, Norduijn (Holland); Leake (India); Strampeli (Italy); Nilssonehle (Sweden); Chodat (Switzerland); Boris de Fedtschenko (Russia); Arechavaleta (Uruguay), etc.

A NEW ZEALAND ESTIMATE OF THE AMERICAN BREEDERS ASSOCIATION

The January, 1911, number of the *Journal of the Department of Agriculture of New Zealand* contains an article—one of a series on plant breeding—by Prof. A. H. Cockayne (A.B.A.), in which he makes mention of the work of the American Breeders Association in the following language:

> One of the most powerful organizations devoted to the furtherance of breeding is that of the American Breeders Association, an institution which is doing an immense amount of good in securing uniformity of work, formulating methods for special investigation, and, in general, advancing the science of breeding into one of the most essential and valuable of all the sciences connected with agriculture. It is split up into a large number of com mittees, consisting of the ablest investigators in America. The plant-breeding phase of the work is being given full prominence, as it is recognized that plant improvement is one of the primal factors governing the agriculture of the present day. Its membership is already over eight hundred strong, and is constantly increasing. During the past, great prominence has been given in all countries to animal breeding, and the results achieved have led to the establishment of many organizations dealing with the subject; but the American Breeders Association recognizes that plant breeding should go hand-in-hand with animal

breeding, and the influence of this association is likely to give a great impetus to this work in America, where even now plant-breeding is assuming important proportions. Every experiment station—and there are one or more in every State—devotes a portion of its funds to plant improvement, and much of the money of the "Adams Act" is to be used in this connection. The crying need of the present-day farmer is to increase the returns from the area he cultivates, and to enable him to do this the aid of the plant breeder must be invoked. The American Breeders Association, in bringing before public notice the urgent necessity of more breeding work, especially with plants, conducted in a truly scientific manner, and pursued with a definite aim, will be conducive of much good.

NOTE FROM NORWAY

Dr. H. H. Gran, professor of the botanical laboratory of the University of Christiania, Norway, and member of the American Breeders Association writes that the Norway Horticultural Society, of which, by the way, he is president, has systematically begun work in plant breeding.

ACKNOWLEDGMENT

The editor of the *Magazine* is indebted for permission to reproduce the likeness of Benjamin Tomkins, Jr., to Mr. T. F. B. Sotham. The plate is from Mr. William Sotham's work on "The History of Hereford Cattle."

PUBLICATIONS RECEIVED

SPINELESS CACTUS. Luther Burbank, Santa Rosa, Cal. 32 pp. Illustrated. A history and description of varieties of Opuntia (spineless cactus).

EINFUEHRUNG IN DIE EXPERIMENTELLE VERERBUNGSLEHRE. Prof. Dr. Erwin Baur. 1911. 293 pp., 80 text figures, 9 colored plates. Publishers, Gebrueder Borntraeger, Berlin.

DIE DEUTSCHE LANDWIRTSCHAFTLICHE PFLANZENZUCHT. Dr. P. Hillmann, manager of the seed-growing division of the German Agricultural Association. Prepared under authority of the organization. 1910. 663 pp.; 346 illustrations and 1 colored plate. Publishers, Deutsche Landwirtschafts Gesellschaft, Berlin.

CONFIDENCES. Talks with a young girl concerning herself. By Edith B. Lowry, M.D. Forbes and Company, Chicago. 1911. 94 pp.

TRUTHS. Talks with a boy concerning himself. Same author and publisher. 1911. 95 pp.

These are two companion books, and what is said below applies to both. They are designed to be placed, and in the reviewer's opinion ought to be placed, in the hands of every boy and girl of from ten to

fourteen years of age. And as a matter of fact thousands of adults might profitably read these books.

"Confidences" and "Truths" tell in simple conversational style of the mystery of reproduction and of the care of the body. The language is chaste, direct, and personal, and it is all said so charmingly, delicately, and winningly that the author is sure to gain the confidence of her young reader. The penalties which nature inflicts upon those who disobey either knowingly or ignorantly are referred to incidentally and as a warning, and not in a way likely to frighten.

Dr. Lowry has rendered parents and all in charge of young lives a real service. It is doubtful if wise instruction such as contained in these books can be imparted as well by any grown person not having special training. Many parents find themselves tongue-tied in conversations on this subject with their children. But that parents should place upon strangers, playmates, or servants the terrible responsibility of imparting this knowledge to their children is criminal. We have come to realize that silence and evasion are stupid and criminal and have been the cause of untold harm. There is springing up a healthy sentiment in favor of meeting parental responsibility with becoming sense and intelligence, and of giving timely and sensible instruction to youths concerning sex life and the elemental biological processes. Dr. Lowry has hit upon a most happy way of telling her story. "Confidences," written for girls, is if anything written in brighter vein than the other book. These booklets should be the counsellor of every boy and girl.

THE SOCIAL DIRECTION OF HUMAN EVOLUTION, AN OUTLINE OF THE SCIENCE OF EUGENICS. William E. Kellicott, Professor of Biology, Goucher College. 249 pp., 29 illustrations. D. Appleton and Company. 1911.

Incorporating the essence of lectures delivered before the students of Oberlin College, this book is written in plain, easily understood English, and is a welcome addition to the number of works treating on eugenics in popular language. Presentation of the subject in this manner from authoritative sources will be the urgent need of the eugenics propaganda for many years to come. Decades will probably have to pass before the racial conscience will be awakened to the realization of the enormities of the crimes committed under the cloak of custom, tradition and prudery, against the integrity of the race. Books almost without number, written in all languages, for all classes of people, will be needed to perform this important educational function. The book is optimistic, though not for a moment losing sight of the difficulties and obstacles in the way of eugenic reforms.

The outline does not pretend to present the results of research work or of original investigations on eugenics by the author. On the contrary, he draws upon the work of those who have done fundamental research in this new science and shows the bearing of their discoveries on economic and social conditions.

In intention the book is suggestive, giving in large, boldly-drawn but necessarily fragmentary outlines a view of the entire field of human heredity. The best written and perhaps the most interesting part of the book is the second half, in which is proposed and discussed a eugenics program.

Some criticism may be offered upon the author's lack of uniformity in the use of symbols to illustrate heredity charts. The appearance and readability of the book would have been considerably improved by using the symbols employed by the Eugenics Section of the American Breeders Association. The uniform and general use by writers and publicists of these symbols would soon lead to recognition and knowledge of their meaning among the general public and even on the part of the casual reader. The sooner this can be accomplished the better are the prospects of eugenic teachings sinking into the public mind.

THE LAW OF SEX DETERMINATION AND ITS PRACTICAL APPLICATION. Laura A. Calhoun. 254 pp., 2 illustrations. The Eugenics Publishing Company, New York City. 1910.

This sizable work is another contribution to the very numerous theories of sex determination or production of sex at will. It is apparent that the author makes a serious attempt to treat the subject from a scientific point of view. But the major premise of the dissertation is not based upon conclusions obtained by scientific methods. It lacks experimental evidence and the support of statistical data. In fact, the author seems to realize this, to judge from the admissions, direct or implied, that she has not given the theory the necessary experimental corroboration or tests. To cite an instance; after explaining her view of the effect under her law of sex determination, in case of partial castration of domestic animals, she suggests: "This could be tested by a breeder of animals, and if proved to be the case would be of great value."

Part of the book is devoted to a review of the status of the study of the heredity of sex, origin of sex, relation of the cell to sex, and theories of sex determination which have from time to time been put forward. The author is aware of the fact that the number of these

theories runs pretty well into the hundreds. There are other hundreds of "theories" and "recipes," notable chiefly for their grotesqueness, which are practiced by farmers and breeders for controlling sex of offspring of domestic animals.

The book is reflective but hardly conclusive. It seems that the author would need a very much larger number of cases to prove the correctness of her theory, and to submit a physiological and cytological rationale of the processes involved.

A new and heretofore apparently unobserved phenomenon is described and termed "telegyny." A considerably larger basis of fact than is submitted will be required to command a serious consideration of this theory from genetists in their present skeptical state of mind. Telegyny, in brief, is a peculiar influence exerted by the "previous female."

If this book shall bring us nearer to the solution of the difficult problem of sex control it will establish for itself a most enviable place.

A STUDY OF THE IMPROVEMENT OF CITRUS FRUITS THROUGH BUD SELECTION. A. D. Shamel. Circular No. 77, Bureau of Plant Industry, U. S. Department of Agriculture. 19 pp., 25 illustrations. 1911.

NATIONAL VITALITY, ITS WASTES AND CONSERVATION. Irving Fisher. Senate Doc. No. 419, 61st Congress, 2d Session. Presented by Mr. Owen. 122 pp. An extract from Report of the National Conservation Commission. 1910.

THE STUDY OF HUMAN HEREDITY. Bulletin No. 2, Eugenics Record Office. Charles B. Davenport, H. H. Laughlin, David F. Weeks, M.D., E. R. Johnstone, Henry H. Goddard. Cold Spring Harbor, N. Y. 17 pp., 4 illustrations. A guide for field workers and others interested in collection of heredity data. Being an exposition of the methods in use at the Eugenics Record Office, the New Jersey State Village for Epileptics, the Training School for Backward and Feeble-minded Children at Vineland, N. J.

Several pages are devoted to symbols, abbreviations, and heredity charts, illustrating their proper construction and the use of symbols and abbreviations. This paper will appear in full in the bound Annual Report of the American Breeders Association.

ASSOCIATION MATTERS

CHANGES OF ADDRESS

Members who may have occasion to change their address during the year are requested to advise the Secretary, giving their old as well as new addresses, so that the mailing list of the Association may be kept correct and up to date.

PORTRAITS OF SCIENTISTS AND BREEDERS

Separate prints of the portraits of scientists and breeders which have appeared in the *Magazine* during 1910 may be obtained from the Secretary's office at ten cents each postpaid. These portraits are printed in sepia tone on sepia paper and are especially suitable, when framed, for adorning the walls of offices, class-rooms, and dens.

TO JOG THE MEMORY

Members of the American Breeders Association who may have received their due bills of membership for this year are respectfully requested to make remittances promptly. Each lot of renewal notices sent out by the Secretary's office entails upon the Association considerable expense for postage and clerk hire. Kindly coöperate in saving this outlay.

CHANGE OF PLAN WITH REGARD TO MAGAZINE

The publications of the American Breeders Association, viz., the *Magazine* and Annual Report, are the results of the coöperation of its active members. They have given these enterprises admirable support from their inception, contributing always freely at no small sacrifice of time and effort.

During 1910 the plan was followed of publishing all papers suitable for magazine matter in the *Magazine* and republishing these, together with the more strictly scientific papers, in the Annual Report. This resulted, even with exercise of the greatest discrimination, in making the 1910 volume of the *Magazine* rather more technical than was desirable in a magazine planned along popular lines. To meet this criticism it was decided hereafter to publish in the *Magazine* only popular articles, reserving the strictly scientific ones for the Annual Report No. VII and not republishing in the latter any of the articles

appearing in the *Magazine*. In doing this the editors have assumed the task of printing fully one-half more matter than had been published by the Association in any one year, and have to a certain extent imposed upon the members the task of contributing more largely than formerly.

It is to be hoped that members will continue to be animated by the spirit of coöperation, and contributions from members and from non-members in the way of articles, news, notes, or photographs will be welcome at all times.

TEN THOUSAND NEW MEMBERS WANTED

Here is one suggestion how to get those 10,000 new members. You surely have among your friends and acquaintances a number who are interested in some phase of breeding or in eugenics. If so, will you write at least ten a letter, or speak to them personally, inviting them to join the American Breeders Association?

Explain that they should join; that through their membership they will help in the promotion of a large and vital movement; that every person interested in things that live and grow, and every person possessing pride of family and race should read the *American Breeders Magazine* and catch the inspiration of its optimistic world philosophy, and the faith in the possibilities of the human race; that to be identified with a movement of such vast import and possibilities confers distinction.

Write the Secretary of the Association advising him of the name and address of the persons you are corresponding or conferring with, in order that your efforts may be supported from this end of the line and that we may send circulars and sample copies of the *Magazine* to your nominees. The Association needs earnest, loyal, personal work on the part of each one of its members. Let us get those ten thousand members within the next twelve months. This is only about two hundred from each State and should be easy of accomplishment.

THE AMERICAN BREEDERS ASSOCIATION TO ITS PARENT[1]

The Association of American Agricultural Colleges and Experiment Stations, Greetings:

By unanimous vote of the American Breeders Association at its sixth annual meeting, its Council was directed to extend greetings

[1] Read before the meeting of the Association of American Agricultural Colleges and Experiment Stations by Prof. W. M. Hays, Secretary of the American Breeders Association, on Nov. 17, 1910.

to its parent organization, the Association of American Agricultural Colleges and Experiment Stations. I have the honor, therefore, in the name of the Council of the American Breeders Association, to express to you, our parent organization, our feeling of high regard and our profound gratitude for your service to all interested in the objects of the new organization.

In 1899 the idea occurred to those attending the Hybridizers' Conference in London, under the auspices of the Royal Horticultural Society, that there should be in America an association of breeders, which should include both those interested in plants and those interested in animals. This suggestion was placed before Secretary Wilson, who suggested that a committee of the Association of American Agricultural Colleges and Experiment Stations would be the best auspices under which to organize such an association. Following this suggestion, a promotion committee was appointed at the annual meeting of the Association of American Agricultural Colleges and Experiment Stations at New Haven, Conn., in 1900.

Under the call issued by the promotion committee appointed for that purpose by the Association of American Agricultural Colleges and Experiment Stations, a meeting was held during the last days of December, 1903, in St. Louis, Mo., at which the American Breeders Association was formed. Since that time six annual meetings have been held, at Champaign, Ill., Columbus, Ohio, Lincoln, Nebr., Washington, D. C., Columbia, Mo., and Omaha, Nebr. The seventh annual meeting has been called to meet with the National Corn Exposition at Columbus, Ohio, February 1, 2 and 3, 1911.

The American Breeders Association has successfully carried out the purpose of your organization committee in bringing together both the scientists and the practical breeders interested in both plant breeding and animal breeding. As originally formed, besides general officers, there was a Section of Plant Breeding and a Section of Animal Breeding. By a nearly unanimous vote by mail of the membership in 1910 the Constitution of the Association was changed, adding a third section relating to heredity in man, called the Eugenics Section.

The reports of the annual meetings already published and now in preparation have the credit in America and abroad of containing the best collection extant of authentic knowledge relating to heredity and breeding. During 1910, the Association established a magazine under the name *American Breeders Magazine*. Up to this time the membership was confined largely to scientists and technical breeders,

but with the organization of a magazine the effort is being made to build up a large membership of practical plant breeders and animal breeders and of people who have a general interest in heredity in man.

The work of the Association is largely done through committees, nearly fifty in number. These committees carry the main responsibility of securing from the members of the Association and others the addresses and papers presented at the annual meeting. These papers, together with special articles, editorials, and news items secured by the Secretary or prepared in his office, make up the subject matter of the *Magazine*. As yet a large part of the material of the *Magazine* is reprinted in the Annual Report. Members are requested to use the individual numbers of the *Magazine* in securing new members, depending upon the bound Annual Report for their files of the scientific articles.

The $2 annual membership fee from about one thousand members has paid the necessary expenses for stationery and for printing the Annual Report. The increasing membership which comes with the establishment of the *Magazine* promises to pay expenses and to gradually build up the *Magazine*. The Association is at present on a basis of something over one thousand members and 150 life memberships. The $20 fee for life membership has given a permanent fund of about $3,000. The management of the Association has always kept the expenses within its income and at present there is a small surplus in the current expense fund which is now being used in a campaign for greatly enlarging the membership.

The American Breeders Association is proud to come back to its parent Association with a substantial report of progress. It is fair to say that the new Association has greatly increased the interest in the scientific study of heredity, in the improvement of our several billion dollars' worth of plant products, and in the better scientific breeding of our domestic animals. It has assumed the delicate yet important task of leadership in the discussion of heredity of the human family. The officers of the Section of Eugenics, the committees on the different phases of heredity in man, and the editorial officers of the *Magazine* and Annual Report have adopted the policy of instituting scientific investigation rather than entering campaigns for promoting any existing theories regarding the improvement of heredity in man. Under the direction of this section, private funds have been supplied so that a number of people are devoting their entire time to investigations in different phases of eugenics. An article in No. 3

of Vol. 1 of the *Magazine* by Dr. Goddard of New Jersey on "Heredity of Feeble-Mindedness" illustrates the fact that we have an open field for investigation of very great importance in human heredity.

It is believed that the Association is greatly stimulating the work of breeding in departments of agriculture and state experiment stations and by private institutions and individuals. Annually larger and larger expenditures of money and time are being devoted to working out the facts and methods needed by breeders of plants and animals, and larger and larger sums are being placed at the disposal of those who under public or private auspices create new varieties, breeds, and strains with new values.

The promotion committee which called the first meeting of the American Breeders Association was composed of the following-named gentlemen: Prof. W. M. Hays, University of Minnesota, St. Anthony Park, Minn., chairman; Director L. H. Bailey, Cornell University, Ithaca, N. Y.; Prof. Thomas F. Hunt, Cornell University, Ithaca, N. Y.; Dr. Herbert J. Webber, U. S. Department of Agriculture, Washington, D. C., and Dean Charles F. Curtiss, Iowa Agricultural College, Ames, Iowa.

The Association and its Council have assumed the work delegated to the promotion committee. It is now suggested that this statement be received as the final report of the promotion committee and that it be discharged.

The new Association comes to the old, not only to express its deep gratitude, but also to express the most hearty good will and the wish for the broadest coöperation in the future.

Sincerely and with gratitude,

W. M. HAYS, *Secretary for the Council.*
C. F. CURTISS, *Chairman Animal Section.*
H. J. WEBBER, *Chairman Plant Section.*

RECEPTION OF A. B. A. ANNUAL REPORT NO. VI

Volume VI far surpasses the high quality of previous A. B. A.'s. We are all pleased with it.—ARTHUR W. GILBERT, *Cornell University.*

The American Breeders Association Report Volume VI is just to hand and we think it fine.—B. F. KAUPP, *State Agricultural College, Denver, Colo.*

You are to be congratulated on the wonderful progress made by this Association.—JAMES E. RICE, *New York State College of Agriculture.*

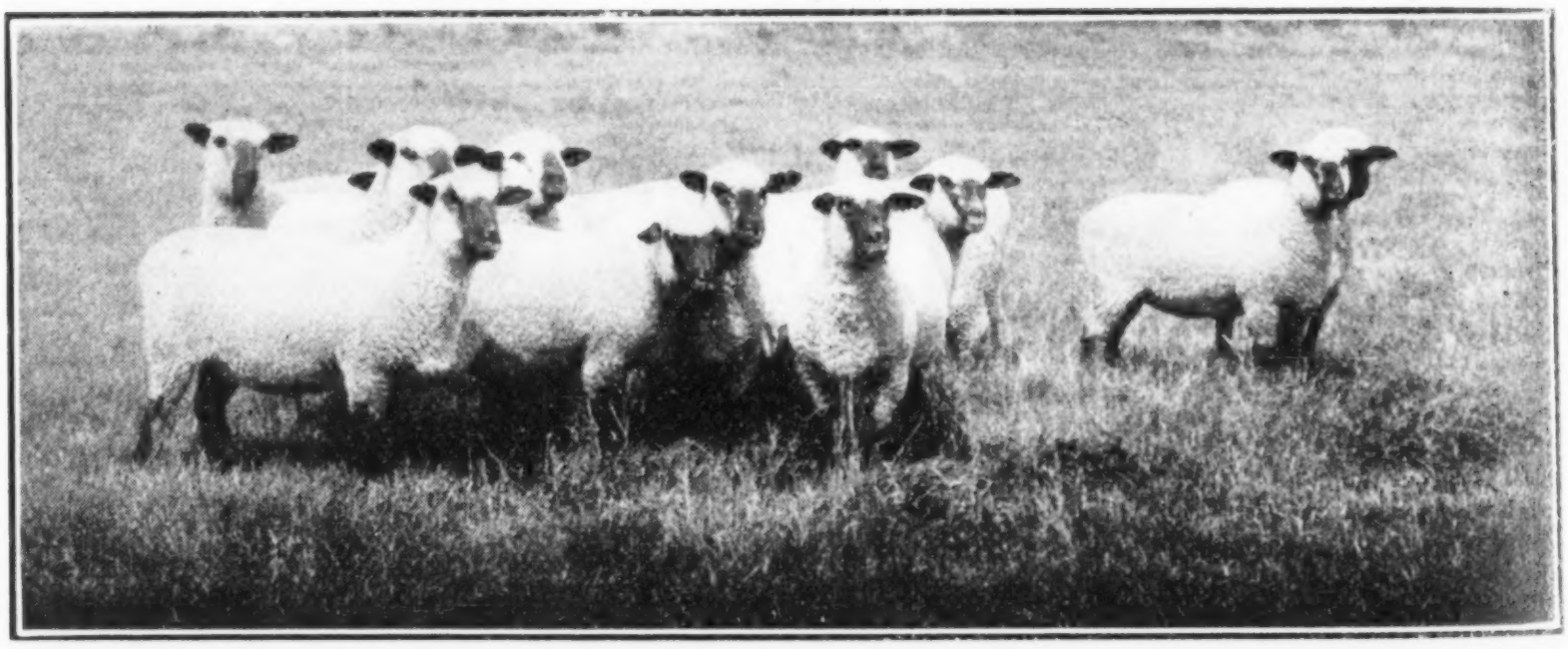
I want to congratulate you on the splendid work that has been done during the past year. I have gone pretty thoroughly into the report and am more

than pleased.—E. R. JOHNSTON, *New Jersey Training School for Feeble-Minded Children.*

Am very much pleased to note the commendable progress made by our Association, and hope it may continue to flourish and widen its scope of usefulness.—C. N. KEENEY, *LeRoy, N. Y.*

We think Volume VI the neatest, nicest printing and binding of the entire series.—Q. I. SIMPSON, *Palmer, Ill.*

The proceedings came along in due time and are intensely interesting.—HERBERT QUICK, *Editor Farm and Fireside, Madison, Wis.*



Courtesy of H. D. Ayer, Animal Photographer, St. Anthony Park, Minn.

IMPORTED HAMPSHIRE DOWN EWES.